

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES



In re Application of

SILBERT P. HYATT

Serial No. 08/464,034

Docket No. 751

Filed: June 5, 1995

For: IMPROVED IMAGE PROCESSING
ARCHITECTURE

Group Art Unit: 2621

Examiner: Brian Werner

APPEAL BRIEF

Hon. Commissioner For Patents
P.O. Box 1450, Alexandria, VA 22313-1450
ATTENTION: Board of Patent Appeals and Interferences

May It Please The Honorable Board:

This is an Appeal from the action of the Primary Examiner finally rejecting all claims in the final Action dated March 9, 2005 (the "instant Action"). This final Action incorporates-by-reference material from the prior Action dated May 3, 2004. An Appeal Brief in compliance with 37 CFR 41.37(c) is provided hereinafter.

The following Table of Contents is the equivalent of an Executive Summary of the issues treated in this Appeal Brief.

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| | 9.5 <u>HYATT V. DUDAS</u> , 1:03-CV-00108 (EGS), MEMORANDUM OPINION (DOCUMENT 75) (D.D.C. OCTOBER 13, 2005) | | |
| 10 | RELATED PROCEEDINGS APPENDIX | | |

1 THE REAL PARTY IN INTEREST

The real party in interest is the Appellant, Gilbert P. Hyatt.

2 RELATED APPEALS AND INTERFERENCES

Appeals filed in the copending applications and in the instant application are listed below.

Copies of the decisions on appeal, if they have been rendered, are set forth in Section 10.

TABLE OF RELATED APPEALS AND INTERFERENCES

| <u>Docket No.</u> | <u>Serial No.</u> | <u>Appeal No.</u> | <u>← Date of Decision →</u> | |
|--------------------------|--------------------------|--------------------------|------------------------------------|----------------------------|
| | | | <u>on Appeal</u> | <u>on Rehearing</u> |
| 321 | 07/289,355 | 1994-3042 | 12/21/2000 | NONE |
| 708 | 08/457,211 | 2004-0353 | 05/31/2005 | 09/21/2005 |
| 709 | 08/457,728 | 2003-0525 | 07/30/2004 | 11/30/2004 |
| 714 | 08/458,104 | 2005-1005 | 11/22/2005 | PENDING |
| 715 | 08/456,901 | 2003-0472 | 08/25/2004 | PENDING |
| 716 | 08/457,362 | -- | -- | -- |
| 717 | 08/456,398 | -- | -- | -- |
| 718 | 08/457,194 | -- | -- | -- |
| 719 | 08/457,197 | -- | -- | -- |
| 728 | 08/459,848 | -- | -- | -- |
| 734 | 08/461,567 | 2002-1518 | 05/30/2003 | 11/24/2003 |
| 739 | 08/458,549 | -- | -- | -- |
| 740 | 08/464,512 | -- | -- | -- |
| 748 | 08/464,998 | -- | -- | -- |
| 750 | 08/463,824 | -- | -- | -- |
| 755 | 08/465,173 | -- | -- | -- |
| 757 | 08/465,657 | -- | -- | -- |
| 760 | 08/465,072 | 2002-0652 | 06/30/2003 | 09/30/2003 |
| 766 | 08/465,200 | -- | -- | -- |
| 768 | 08/464,992 | -- | -- | -- |
| 769 | 08/465,199 | -- | -- | -- |
| 772 | 08/469,262 | -- | -- | -- |
| 779 | 08/471,633 | 2002-0623 | 10/24/2003 | 01/30/2004 |
| 791 | 08/469,888 | -- | -- | -- |
| 796 | 08/469,060 | -- | -- | -- |

TABLE OF RELATED APPEALS AND INTERFERENCES (CONTINUED)

| <u>Docket No.</u> | <u>Serial No.</u> | <u>Appeal No.</u> | <———— Date of Decision ———> | |
|--------------------------|--------------------------|--------------------------|--|----------------------------|
| | | | <u>on Appeal</u> | <u>on Rehearing</u> |
| 773 | 08/469,261 | -- | -- | -- |
| 792 | 08/466,557 | -- | -- | -- |
| 702 | 08/458,143 | -- | -- | -- |
| 782 | 08/471,695 | -- | -- | -- |
| 790 | 08/469,889 | -- | -- | -- |
| 794 | 08/471,846 | -- | -- | -- |
| 777 | 08/466,599 | -- | -- | -- |
| 776 | 08/466,600 | -- | -- | -- |
| 736 | 08/458,206 | -- | -- | -- |
| 751 | 08/464,034 | -- | -- | -- |

3 STATUS OF CLAIMS

Claims 105-173, 187-281, 301, 380-383, 385-416, and 418-583 are pending in the instant application. No claims are allowed.

All pending claims stand finally rejected and are appealed herein.

The representative antecedent basis in the figures and in the verbal description for each of the appealed independent claims is set forth in Section 5. All of the appealed claims are grouped for each of the relevant rejections in Section 6. The grounds of rejection to be reviewed on appeal for each of the appealed claims is discussed in Section 7.1. Each of the appealed claims are set forth at length in Section 8, the claims appendix.

4 STATUS OF AMENDMENTS

The Examiner has considered all prior amendments.

5 SUMMARY OF CLAIMED SUBJECT MATTER

5.1 CONCISE EXPLANATION OF THE SUBJECT MATTER OF EACH INDEPENDENT CLAIM

Tables 5.1.1, 5.1.2, et seq. hereinafter identify representative antecedent basis in the disclosure for each appealed independent claim with citations to the figures and to the specification. This tabular form is consistent with the law of the Federal Circuit. See the section entitled “The Federal Circuit Analyzes Written Description On An Individual Limitation-By-Limitation Basis In Simple Tabular Form” (Section 7.4.8). It is important to note that Tables 5.1 et seq. are far more detailed than the simple tabular form used by the Federal Circuit (Section 7.4.8).

For each page in Tables 5.1.1.A, 5.1.2.A, et seq.,¹ the top row lists each independent claim addressed on that page and identifies the type of claim.² The left-hand columns number and list the “Claim Limitations” and the “Disclosure Page(s)”, the “Disclosure Figure(s)”, and the “Disclosure Ref. No.” in the figure for the corresponding “Claim Limitations(s)”.³ The “X”s in the claim matrix identify which of the claim limitations are recited in each particular independent claim.⁴

The relevant interconnections in Fig. 1A should be apparent from inspection of Fig. 1A in view of Tables 5.1.1, 5.1.2, et seq., as summarized in Tables 5.2.1, 5.2.2, et seq.⁵

The passages in the specification that are cited in Tables 5.1.1, 5.1.2, et seq. (the “Disclosure Page(s)”) are excerpted and set forth in Section 5.8 for the convenience of the Board.

¹ Upon request, the Appellant will provide foldout tables.

² “A” identifies an apparatus claim, “P” identifies a process claim, and “M” identifies a means claim.

³ The “Ref. No.” is the reference designation in the cited figure(s) that illustrate the corresponding “Claim Limitations(s)”.

⁴ For economy of space, a single citation to each, the figures and the specification, is provided in these tables.

⁵ The rows in Tables 5.1.1 et seq. line up with the corresponding rows in Table 5.2.1 et seq. for ease of cross-referencing.

Claims are grouped together when they have similar limitations (but different combinations). These tabular groupings are each designated with a different table number (e.g.; 5.1.1, 5.1.2, et seq). Subsequent table designations identify horizontally-partitioned pages and vertically-partitioned pages for that table, as discussed below.

When the claims that are grouped together in a table **do not fit horizontally** on a single page, they are placed in a row of different pages. Each of these horizontally-partitioned pages of the same table has the same “Claim Limitations” numbers listed at the left hand side of the grouped pages to cross-reference the rows of “Claim Limitations” across the horizontal partitions. Each of these horizontally-partitioned pages of the same table has the same table numeral (e.g.; 5.1.1 or 5.1.2) and has a different horizontal partition numeral designation (e.g.; Table 5.1.1 may have horizontally partitioned pages 5.1.1.1, 5.1.1.2, 5.1.1.3, et seq and Table 5.1.2 may have horizontally partitioned pages 5.1.2.1, 5.1.2.2, 5.1.2.3, et seq).

When the limitations for a grouped set of claims in a table **do not fit vertically** on a single page, they are placed in a column of different pages. Each of these vertically-partitioned pages of the same table has the same claim numbers listed at the top of the grouped pages to cross-reference the columns of claims across the vertical partitions. Each of these vertically-partitioned pages of the same table has the same table numeral (e.g.; 5.1.1 or 5.1.2) and has a different vertical partition alphabetical designation (e.g.; Table 5.1.1 may have vertically partitioned pages 5.1.1.1.A, 5.1.1.1.B, 5.1.1.1.C, et seq and Table 5.1.2 may have vertically partitioned pages 5.1.2.1.A, 5.1.2.1.B, 5.1.2.1.C, et seq).

TABLE 5.1.1.1.A
EXAMPLES OF CLAIM FUNCTION CITES TO SPEC. & FIG. 1A

| | CLAIM LIMITATION | Page(s) | INDEP. CLAIM NUMBER | | CLAIM TYPE | | | | | | | | | | | | | | | | 98 |
|----|--------------------------|----------------------|---------------------|---------------------|------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|
| | | | | | A | A | A | P | P | P | A | A | A | A | P | P | P | A | A | A | |
| | | | | | | | | | | | | | | | | | | | | | |
| 1 | first | 16 | Fig. 1A Block | 110L,110M,110C,110P | X | X | X | | | | | | | | | | | | | | |
| 2 | memory | 19,38,80-137,206-211 | | 110A | X | X | X | | | | | | | | | | | | | | |
| 3 | prior | 94,95 | | 110A | X | X | X | X | | | | | | | | | | | | | |
| 4 | next | 94,95 | | 110A | X | X | X | X | | | | | | | | | | | | | |
| 5 | pixel | 27 | | 110A | X | X | X | X | | | | | | | | | | | | | |
| 6 | image info | 20,54 | | 110A | X | X | X | X | | | | | | | | | | | | | |
| 7 | prior image | 95,248 | | 110A | X | X | X | X | | | | | | | | | | | | | |
| 8 | second | 16 | | 110L,110M,110C,110P | X | X | X | | | | | | | | | | | | | | |
| 9 | next image | 95,248 | | 110A | X | X | X | X | | | | | | | | | | | | | |
| 10 | spatial interpolation | 248 | | 110R | X | X | X | | | | | | | | | | | | | | |
| 11 | subpixel | 102,106-107 | | 110A | X | | | X | | | | | | | | | | | | | |
| 12 | vector change | 158 | | 110A | X | | | | | | | | | | | | | | | | |
| 13 | subpixel resolution | 102,106-107 | | 110A | X | | | | | | | | | | | | | | | | |
| 14 | transform | 39,49 | | 110A | X | X | | | | | | | | | | | | | | | |
| 15 | processor | 4 | | 110A | X | X | | | | | | | | | | | | | | | |
| 16 | transformed image info | 48 | | 110A | X | X | | | | | | | | | | | | | | | |
| 17 | weight circuit | 20-21 | | 110E | X | | | | | | | | | | | | | | | | |
| 18 | weight info | 18-19 | | 110R | X | | | | | | | | | | | | | | | | |
| 19 | scale factor circuit | 285 | | 110A | X | | | | | | | | | | | | | | | | |
| 20 | scale factor info | 144 | | 110S | X | | | | | | | | | | | | | | | | |
| 21 | weighting and scaling | 562 | | 110R | X | | | | | | | | | | | | | | | | |
| 22 | scaled weighted image | 562 | | 110R | X | | | | | | | | | | | | | | | | |
| 23 | resolution reduction | 499 | | 110A | X | | | | | | | | | | | | | | | | |
| 24 | reduced resolution image | 499 | | 110A | X | | | | | | | | | | | | | | | | |
| 25 | communication link | 64 | | 110L | X | | | | | | | | | | | | | | | | |

TABLE 5.1.1.2.A
EXAMPLES OF CLAIM FUNCTION CITES TO SPEC. & FIG. 1A

[illegible]

TABLE 5.1.1.3.A
EXAMPLES OF CLAIM FUNCTION CITES TO SPEC. & FIG. 1A

[illegible]

TABLE 5.1.1.1.B
EXAMPLES OF CLAIM FUNCTION CITES TO SPEC. & FIG. 1A

[illegible]

TABLE 5.1.1.2.B
EXAMPLES OF CLAIM FUNCTION CITES TO SPEC. & FIG. 1A

[illegible]

TABLE 5.1.1.3.B
EXAMPLES OF CLAIM FUNCTION CITES TO SPEC. & FIG. 1A

[illegible]

TABLE 5.1.2
EXAMPLES OF CLAIM FUNCTION CITES TO SPEC. & FIG. 1A

[illegible]

5.2 TABLE OF FUNCTIONS AND INTERCONNECTIONS FOR CLAIM LIMITATIONS IN TABLES 5.1.1 ET SEQ

As discussed above, the relevant interconnections in Fig. 1A should be apparent from inspection of Fig. 1A in view of Tables 5.1.1, 5.1.2, et seq, as summarized in Tables 5.2.1, 5.2.2, et seq.⁶

Tables 5.2.1, 5.2.2, et seq hereinafter identify representative interconnections between claimed functions disclosed in Fig. 1A, shown by “X”s in the matrix. The claim limitations in the left-hand columns of Tables 5.2.1, 5.2.2, et seq correspond with the claim limitations in the left-hand columns of Tables 5.1.1, 5.1.2, et seq (e.g.; the claim limitations in the left-hand columns of Table(s) 5.1.1 correspond with the claim limitations in the left-hand columns of Table(s) 5.2.1 and the claim limitations in the left-hand columns of Table(s) 5.1.2 correspond with the claim limitations in the left-hand columns of Table(s) 5.2.2). These claim limitations are also recited across the top of these Tables 5.2.1, 5.2.2, et seq.

An “X” is placed in the matrix to show a disclosed interconnection (Fig. 1A) between a function in the left hand column and the function in the top row that the claims recite that it is “coupled to” or that it operates “in response to”.

Tables 5.2.1, 5.2.2, et seq combine all recited interconnections in the subject independent claims into a single table. Thus, a claim function listed in the left-hand column may be “coupled to” or may operate “in response to” a plurality of different functions at the top of the table, each interconnection being recited in a different claim or claims. Similarly, a claim function listed at the top of the table may be interconnected in different claims to a plurality of different functions listed in the left-hand column.

The blank matrix points in Tables 5.2.1, 5.2.2, et seq mean that the related interconnection is not recited in that grouping of claims, it does not mean that the related interconnection is not disclosed.

⁶ The rows in Tables 5.1.1 et seq, line up with the corresponding rows in Table 5.2.1 et seq for ease of cross-referencing.

The horizontal and vertical partitioning for Tables 5.2.1, 5.2.2, et seq follow the same partitioning notation discussed in Section 5.1 for Tables 5.1.1, 5.1.2, et seq. The rows of “Claim Limitations” in Tables 5.2.1, 5.2.2, et seq correspond with the rows of “Claim Limitations” discussed in Section 5.1 for Tables 5.1.1, 5.1.2, et seq.

TABLE 5.2.1.1.A
EXAMPLES OF FIG. 1A CLAIM FUNCTION CITES AND INTERCONNECTIONS

[illegible]

TABLE 5.2.1.1.B
EXAMPLES OF FIG. 1A CLAIM FUNCTION CITES AND INTERCONNECTIONS

| COUPLED TO/IN RESPONSE TO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|--------------------------|-----------|------|------|------|------|------|------|------|------|------|------------|------|------------|------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------------------------------|--|--|
| | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | | | |
| | weight info | 110E 110A | 110S | 110R | 110R | 110R | 110A | 110A | 110A | 110A | 110R | 110P, 110R | 110K | 110P, 110R | 110P, 110R | 110A | 110R | 110A | 110S | 110R | 110E | 110H | 110A | 110H | 110E | 110R | 110D | 110D | 110L, 110M, 110C, 110P, 110K | | |
| | scale factor circuit | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | scale factor info | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | weighing and scaling | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | scaled weighted image | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | resolution reduction | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | reduced resolution image | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | communication link | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | output image info | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | vector circuit | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | vector info | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | display circuit | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | display device | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | displaying an image | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | frame | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | temporal interpolation | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 64 pixel block | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | motion vector | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | subtraction | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | scale factor memory | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | weight memory | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | memory writing | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | scaled image | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | feedback | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | weighted image | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | delta info | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | difference info | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | third | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | X | | X | | | | | | | | | | | | X | | | X | | | | | X | | | | | | | | |
| 3 | | | | | | | | | | | | | | | X | | X | | X | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | X | | X | X | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | X | | X | | | | | | X | | | | | | | | |
| 6 | | | | | | | | | | X | | | | | X | | X | X | X | | | | X | | | | | | X | | |
| 7 | | | | | | | | | | | | | | | | | X | | X | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | X | X | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | X | | | | X | | | X | | | | | X | | | | | | | | |
| 11 | | | | | | | | | | | | | | | X | | | | | | | | X | | | | | | | | |
| 12 | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | | | | X | | | | | | | | X | | | | | | | | |
| 14 | | | | | | | | | | | | | | | X | | | X | | | | | | | | | | | | | |
| 15 | X | | X | | | | | | | | | | | | X | | X | X | | | X | | X | | | | | | X | | |
| 16 | | | | | | | | | | | | | | | X | | X | X | | | | | X | | | | | | | | |
| 17 | | | | | | | | | | | | | | | X | | X | X | | | | | | | | | | | | | |

TABLE 5.2.1.2.A
EXAMPLES OF FIG. 1A CLAIM FUNCTION CITES AND INTERCONNECTIONS

| | | | COUPLED TO/IN RESPONSE TO | | | | | | | | | | | | | | | | |
|----|-------------------------------|--------------------------|---------------------------|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|
| | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| | CLAIM LIMITATION | | | | | | | | | | | | | | | | | | |
| 18 | | weight info | 110E | X | | | | | | | | | | | | | | X | |
| 19 | | scale factor circuit | 110A | | X | X | X | | | | X | | | | | | | | X |
| 20 | | scale factor info | 110S | | | | | | | | | | | | | | | | |
| 21 | | weighting and scaling | 110R | | X | X | X | X | | | | | | | X | X | | | X |
| 22 | scaled weighted image info | 110R | | X | X | X | X | X | | X | | | | | | | X | X | |
| 23 | resolution reduction | 110A | | | | | | | | | | | | | | | | | |
| 24 | reduced resolution image info | 110A | X | | | | X | | | | | | | | | | X | | |
| 25 | communication link | 110L | | | | | | | | | X | X | | | | | | | |
| 26 | output image info | 110A | | | | | | | | | | | | | | | | | |
| 27 | vector circuit | 110R | | | X | X | X | X | | | X | X | | | | | | | |
| 28 | vector info | 110A | | | X | X | X | X | | | X | X | | | | | | | |
| 29 | display circuit | 110P,110R | | | | | | | | | | | | | | | | | |
| 30 | display device | 110K | | | | | | | | | | | | | | | | | |
| 31 | displaying | 110P,110R | | | X | X | X | X | | | | | | | | | | | |
| 32 | frame | 110A | X | X | X | X | X | | | | | | | | | | | | |
| 33 | temporal interpolation | 110R | X | X | X | X | X | X | | | | | | | | | X | | |
| 34 | 64 pixel block | 110A | X | X | X | X | X | | | | | | | | | | X | | |
| 35 | motion vector | 110R,110S | | | X | X | X | X | | | | | | | | | | | |
| 36 | subtraction | 110D | | | | X | X | | | | | | | | | | | | |
| 37 | scale factor memory | 110R | | | | | | | | | | | | | | | | | |
| 38 | weight memory | 110E | | X | | | | | | | | | | | | | | | |
| 39 | memory writing | 110H | | X | | | | | | | | | | | | | | | |
| 40 | scaled image | 110A | | X | X | X | X | X | | X | X | | X | | | | X | | |
| 41 | feedback | 110H | | | | | X | | | | | | | | | | | | |
| 42 | weighted image | 110E | | X | | | X | X | | | | | | | | | | X | |
| 43 | delta info | 110R | | X | | | X | X | | | X | | | | | | | | |
| 44 | difference info | 110D | | | | | X | X | | | | | | | | | | | |
| 45 | third | 110L,110M,110C,110P,110K | | X | | | | X | | | | | | | | | | X | |

TABLE 5.2.1.1.B
EXAMPLES OF FIG. 1A CLAIM FUNCTION CITES AND INTERCONNECTIONS

| COUPLED TO/IN RESPONSE TO | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|--|--|
| | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | | | |
| 18 | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | |
| 19 | X | | X | | | | | | | | | | | | X | | | | | X | | | | | | | | | | | |
| 20 | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 21 | X | X | X | | | | | | | | X | | | | X | | | | | | | | | | | | | | | | |
| 22 | X | X | X | | | | | | | | X | | | | | | | | | | | X | | | | | | | | | |
| 23 | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 24 | | | | | X | | | | | | | | | | | X | X | | | | | | | | | | | X | | | |
| 25 | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | | |
| 26 | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | | |
| 27 | | | | | | | X | | | | | | | | X | | | | | | | | | | | | | | | | |
| 28 | | | | | | | | | | | X | | | | X | | X | | | | | | | | | | | | | | |
| 29 | | | | | | | X | | | | | X | | | X | | | | | | | | | | | | | | | | |
| 30 | | | | | | | X | | | | | X | | | | | | | | | | | | | | | | | | | |
| 31 | | | | | | | | | | | | X | | | X | | | | | | | | | | | | | | | | |
| 32 | | | | | | | | | | | | | | | X | | X | X | | | | | | | | | | | | | |
| 33 | | | | | | | | | | | | | | | X | | X | X | | | | | | | | | | | | | |
| 34 | | | | | | | | | | | | | | | X | | X | X | | | | | | X | | | | | | | |
| 35 | | | | | | | | | | | | | | | X | | X | X | | | | | | X | | | | | | | |
| 36 | | | | | | | | | | | | | | | | | X | X | | | | | | X | | | | | | | |
| 37 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 38 | X | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | |
| 39 | X | X | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | |
| 40 | | | | | | | | | | | | | | | | | X | | X | | X | | X | | | | | | | | |
| 41 | | | | | | | X | | | | | | | | X | | X | | | | X | | | | | X | X | | | | |
| 42 | X | | | | | | | | | | | | | | X | | | | | | X | | | | | | | | | | |
| 43 | | | | | | | | | | | | | | | | | | | | | X | | | | | | | | | | |
| 44 | | | | | | | | | | | | | | | | | | | | | | | | X | | | | | | | |
| 45 | X | | | | | | | | | | | | | | | X | X | | | | | | | | | | | | X | | |

TABLE 5.2.2
EXAMPLES OF FIG. 1A CLAIM FUNCTION CITES AND INTERCONNECTIONS

| | | COUPLED TO/IN RESPONSE TO | | | | | | | | | | | | | | |
|----|-------------------------|------------------------------|-------|------------|------------------------------|-------------|-------------------------|----------|----------------------|-------------------|---------|---------------------|-----------|-------------|---------------|---------------|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| | | first | field | image info | second | vector info | temporally interpolated | subpixel | spatial interpolated | scaled image info | scaling | weighted image info | weighting | transformed | motion vector | interpolation |
| | Fig 1A Block | 110L, 110M, 110C, 110P, 110K | 110A | 110A | 110L, 110M, 110C, 110P, 110K | 110A | 110R | 110A | 110R | 110A | 110R | 110E | 110R | 110A | 110R, 110S | 110L |
| | | | | | | | | | | | | | | | | |
| | CLAIM LIMITATION | | | | | | | | | | | | | | | |
| 1 | first | X | X | X | | X | | X | | | | | | | | |
| 2 | field | X | X | X | X | | | X | | | | | | | | |
| 3 | image info | | | | | X | | | | | | | | | | |
| 4 | second | X | X | X | X | X | | X | | | | | | | | |
| 5 | vector info | X | X | X | X | | | | | | | | | | | |
| 6 | temporally interpolated | X | X | X | | | | | | | | | | | | |
| 7 | subpixel | X | X | X | X | X | | X | | | | | | | | |
| 8 | spatial interpolated | X | X | X | X | X | | X | | | | | | | | |
| 9 | scaled image info | X | X | X | X | X | | X | | | | | | | | |
| 10 | scaling | X | X | X | X | X | | X | | | | | | | | |
| 11 | weighted image info | X | X | X | X | X | | X | | | | | | | | |
| 12 | weighting | X | X | X | X | X | | X | | | | | | | | |
| 13 | transformed | X | X | X | X | X | | X | | | | | | | | |
| 14 | motion vector | X | X | X | X | X | | X | | | | | | | | |
| 15 | interpolation | X | X | X | X | X | | X | | | | | | | | |

5.3 THE TEACHINGS THROUGHOUT THE DISCLOSURE POINT TO FIG. 1A

The claim limitations in Fig. 1A are described in the top-down format of the disclosure. A reading of representative example disclosures on Fig. 1A is provided below. This reading is related to the claim limitations shown in Tables 5.1.1, 5.1.2, et seq.

The teachings throughout the disclosure point to Fig. 1A (examples are discussed below) in accordance with the top-down end-to-end nature of the disclosure (Section 5.6).

64 pixel block is described (Spec. 197) with respect to the image memory (Fig. 1D, block 111C) which is a part of the geometric module (Fig. 1A, block 110A).

Comm data link is described (Spec. 64) as part of both the input image sources (Fig. 1A, block 110L) and the output device (Fig. 1A, block 110K).

Delta info is described (Spec. 158) as controlled by the address generators of the geometric processor (Fig. 1D, block 111D), a part of the geometric module (Fig. 1A, block 110A).

Difference information is described (Spec. 17) as being generated by the subtraction of images by the Mux (Fig. 1A, block 110D).

Display circuit is described (Spec. 19-20, Fig. 1C, block 111F) as part of the output image interface (Fig. 1A 110P).

Feedback is described (Spec. 17) as being performed by the feedback path (Fig. 1A, block 110H).

Field is described (Spec. 243) as a process of the geometric processor (Spec. 17, Fig. 1D, block 111D) which is a part of the geometric module (Fig. 1A, block 110A).

First instances of the multi-channel system are described (Spec. 16, Fig. 1A, blocks 110L, 110M, 110C, 110P, 110K).

Frame is described (Spec. 39) (30 frames/sec) as a function of the geometric processor (Spec. 20, Fig. 1D, block 111D), which is included in the geometric module (Fig. 1A, block 110A).

Image info is described (Spec. 20, 54) as being loaded by the geometric processor (Fig. 1D, block 111D), which is included in the geometric module (Fig. 1A, block 110A).

Interpolation is described (Spec. 435) in conjunction with decompression (Spec. 434) as a database process (Spec. 21, Fig. 1F, block 112H) a part of the image source (Fig. 1A, Block 110L).

Memory is described (Spec. 19, 38, 80-137, 206-211) as being a part of the geometric module (Fig. 1A, block 110A).

Memory writing circuit is described (Spec. 184, Fig. 1P, block 115C), equivalent to image memory (Fig. 1D, block 11C), which is a part of the geometric module (Fig. 1A, block 110A).

Next is described (Spec. 94, 95) with respect to the progression of images by the geometric processor, which is a portion of the geometric module (Fig. 1A, block 110A).

Next image is described (Spec.95,248) with respect to the progression of images by the geometric processor, which is a portion of the geometric module (Fig. 1A, block 110A).

Output image info is described (Spec. 22) as being delivered to the output (Fig. 1A, block 110K).

Pixel is described (Spec. 27 III C 3) in the modular table section for the geometric module (Fig. 1A, block 110A)/

Prior is described by the code DIS.ASC, (Spec. 265-269) as part of the flow of the Basic code running on the supervisory processor (Fig. 1A, block 110A).

Prior image is described (Spec.95,248) with respect to the progression of images by the geometric processor, which is a portion of the geometric module (Fig. 1A, block 110A).

Processor is described (Spec. 4) as the geometric processor (Fig. 1D, block 111D) which is a part of the geometric module (Fig. 1A, block 110A).

Reduced resolution image info is described (Spec. 499) with respect to the progression of images by the geometric processor, which is a portion of the geometric module (Fig. 1A, block 110A).

Resolution reduction is described (Spec. 499) with respect to the progression of images by the geometric processor, which is a portion of the geometric module (Fig. 1A, block 110A).

Scale factor circuit is described (Spec. 285) as a process of the geometric processor (Spec. 20, Fig. 1D, block 111D) which is a part of the geometric module (Fig. 1A, block 110A).

Scale factor info is described (Spec. 144) as a process of the geometric processor (Spec. 20, Fig. 1D, block 111D) which is a part of the geometric module (Fig. 1A, block 110A).

Scale memory is described (Spec. 567) as the memory locations in the supervisory processor (Fig. 1A, block 110R) which maintain scale information.

Scaled image is described (Spec. 388) as being manipulated by the geometric processor (Spec. 20, Fig. 1D, block 111D) which is a part of the geometric module (Fig. 1A, block 110A).

Scaled image info is described (Spec. 388) as being manipulated by the geometric processor (Spec. 20, Fig. 1D, block 111D) which is a part of the geometric module (Fig. 1A, block 110A).

Scaled and weighted is described (Spec. 562) by the Basic code processed by the supervisory processor (Fig. 1A, block 110R).

Scaling info is calculated (Spec. 562) using Basic code, by the supervisory processor (Fig. 1A, block 110R).

Scale memory is described (Spec. 567) as the memory locations in the supervisory processor (Fig. 1A, block 110R) which maintain scale information.

Second instances of the multi-channel system are described (Spec. 16, Fig. 1A, blocks 110L, 110M, 110C, 110P, 110K).

Spatial interpolation is described (Spec. 248) is performed by the programs (Spec. 31) of the supervisory processor (Fig. 1A, block 110R).

Subpixel is described (Spec. 102, 106-107) in relation to the geometric processor (Spec. 20, Fig. 1D, block 111D) performing translation, rotation etc. The Geometric processor is part of the geometric module (Fig. 1A, block 110A).

Subpixel resolution is described (Spec. 102, 106-107) in relation to the geometric processor (Spec. 20, Fig. 1D, block 111D) performing translation, rotation etc. The Geometric processor is part of the geometric module (Fig. 1A, block 110A).

Subtraction is described (Spec. 17, 401, 497) as being performed by the Mux (Fig. 1A, block 110D).

Temporal interpolation is described as a function of program control (Spec. 248), which is a function of the supervisory processor (Spec 31, Fig. 1A, block 110R).

Third instances of the multi-channel system are described (Spec. 16, Fig. 1A, blocks 110L, 110M, 110C, 110P, 110K).

Transformed is described (Spec. 77) as a function of the geometric processor (Fig. 1D, block 110D) a part of the geometric module (Fig. 1A, block 110A).

Transformed image info is described (Spec. 48) with respect to the image memory (Fig. 1D, block 110C) is a part of the geometric module (Fig. 1A, block 110A).

Vector change is described (Spec. 158) as being managed by the address generators of the geometric processor (Fig. 1D, block 111D), which is part of the geometric module (Fig. 1A, block 110A).

Vector circuit is described (247) as part of the Basic code LD.ASC (SPEC. 558) performed by the supervisory processor (Fig. 1A, block 110R).

Vector info is described (Spec. 4) as being controlled by the geometric processor (Fig. 1D, block 111D), a part of the geometric module (Fig. 1A, block 110A).

Weight info is described (Spec. 18-19) as being provided by the supervisory processor (Fig. 1A, block 110R).

Weighting is described (Spec. 562) in conjunction with the BASIC code of the experimental system, operating on the supervisory processor (Fig. 1A, block 110R).

Weighting and scaling is described (Spec. 562) in conjunction with the BASIC code of the experimental system, operating on the supervisory processor (Fig. 1A, block 110R).

Weight(ing) circuit is described in conjunction with the weight RAM (Spec. 20-21, Fig. 1E, block 111M) which is a part of the spatial module (Fig. 1A, block 110E).

Weight memory is described as weight RAM (Spec. 20-21, Fig. 1E, block 111M) which is a part of the spatial module (Fig. 1A, block 110E).

Weighted image is described in conjunction with the weight RAM (Spec. 20-21, Fig. 1E, block 111M) which is a part of the spatial module (Fig. 1A, block 110E).

Weighted image info is described in conjunction with the weight RAM (Spec. 20-21, Fig. 1E, block 111M) which is a part of the spatial module (Fig. 1A, block 110E).

5.4 THE CLAIM LIMITATIONS ARE ADDRESSED HUNDREDS OF TIMES IN THE DISCLOSURE

Table 5.3 hereinafter identifies the number of times that selected claim limitations are addressed in the disclosure. The symbol > recited in Table 5.3 means “more than” (e.g.; “> 100” means – more than 100 times).

The Appellant is entitled to rely on the Examiner having an electronic copy of the disclosure and the ability to search the disclosure for the claim limitations.⁷ See also:⁸

The examiner has carefully searched Appellant’s lengthy specification both manually and electronically, looking for the features claimed.

⁷ See the Changes To Implement Electronic Maintenance Of Official Patent Application Records; Effective Date: July 30, 2003; Federal Register, Vol. 68, No. 125, June 30, 2003, pp. 38611-38630.

⁸ Examiner’s Answer in copending application 08/461,657 (Appeal No. 2002-1518) at p. 16 (emphasis added).

TABLE 5.3
THE NUMBER OF TIMES SELECTED CLAIM LIMITATIONS
ARE ADDRESSED IN THE DISCLOSURE

| TERM | Number of Times |
|---|-----------------|
| 64 [block / pixels] | >15 |
| block (s) | >80 |
| block(s) of 64 pixels / 64-pixel blocks | >10 |
| communicat- (e) (ing) (ed) (ion) | >10 |
| communication link | =2 |
| delta | >100 |
| differen- (ce) (t) (tial) | >3 |
| display (ing) (ed) | >200 |
| feedback | >5 |
| field (s) | >20 |
| frame (s) | >100 |
| image | >1000 |
| information | >200 |
| interpolat- (e) (ing) (ed) (ion) | >100 |
| memory | >1000 |
| motion | >50 |
| next | >20 |
| output (ting) | >400 |
| output image | =9 |
| pixel | >1000 |
| prior | >5 |
| prior image | >1 |
| processor | >300 |
| reduc- (e) (ed) (ing) (tion) | >10 |
| resolution | >20 |
| reduced resolution | >1 |
| subpixel resolution | =23 |
| scal- (e) (ing) (ed) | >50 |
| scale factor | >30 |
| spatial / spacial (ly) | >100 |
| spacial domain interpolation | =1 |
| subpixel | >20 |
| subtract (ing) (ed) (ion) | >10 |
| temporal (ly) | =4 |
| time/temporal . . . interpolation | >3 |
| transform (ing) (ed) | >5 |
| vector | >50 |
| weight (ing) (ed) | >200 |
| weight memory | >2 |

5.5 THE SO-CALLED “EXAMPLE” CLAIM SELECTED BY THE EXAMINER IS ADEQUATELY DISCLOSED

The Examiner addresses a so-called “example” claim (claim 554) to illustrate the § 112-1 rejections. However, this so-called “example” claim finds ample antecedent basis in the disclosure. See, e.g., Section 5.1 and Fig. 1A. Thus, for this reason alone, the § 112-1 rejections fail to establish a *prima facie* case.

The Examiner relies on this so-called “example” claim as being representative of the other claims regarding the § 112-1 rejections. However, this so-called “example” claim is far from being representative of the other claims. *See* Section 7.3.5.2 and Table 5.1 (Section 5.1). Thus, for this additional reason, the § 112-1 rejections fail to establish a *prima facie* case for the other claims.

5.6 THE INSTANT DISCLOSURE PROVIDES THE EPITOME OF A “SELF-CONTAINED EMBODIMENT” DISCLOSED IN A TOP-DOWN END-TO-END FORMAT

The Examiner apparently requires a so-called “self-contained embodiment” to meet the written description and enablement requirements (prior Action at 5, 10,12, 13, 16, and 61). The instant disclosure provides the epitome of a “self-contained embodiment”. This despite the fact that the Appellant cannot find any law, and the Examiner did not cite to any law, that requires such a “self-contained embodiment”. Thus, the disclosure goes further than the law requires in providing an adequate disclosure.

Fig. 1A and the disclosures related thereto constitute the epitome of a “self-contained embodiment” (Spec. at 17):

The present invention can be used in many applications. One general purpose modular configuration is shown in Figs 1A to 1G and summarized in the MODULAR CONFIGURATION FEATURES TABLE herein. Various other configurations can also be provided.

The claims read on Fig. 1A (Sections 5.1 and 5.2). The “experimental system” (e.g.; Section 5.7) constitutes an important part of the Fig. 1A embodiment and was actually reduced-to-practice. This despite the fact that neither a “self-contained embodiment” nor an actually reduced-to-practice embodiment are required (Section 7.3.4).

The claims are directed to a system having novel combinations of features. The system is disclosed in a “top-down” and “end-to-end” format. The application discloses an entire system (e.g., Figs. 1A and 6A) in extensive detail (e.g., Figs. 6B-6AH). The system is disclosed in great detail both in the figures and in the verbal description, where the verbal description describes the figures in detail often down to the component and the sub-component levels of detail. The top-down and end-to-end format includes details from the front-end (e.g.; the left side of Figs. 1A and 6A) to the back-end (e.g.; the right side of Figs. 1A and 6A) and from the block diagram level of detail (e.g.; Fig. 1A) down to the electronic component, pin, and wire level of detail (e.g.; Figs. 6A-6AH) and even down to the sub-component level of detail (e.g.; the IC specs).

The top-down format ranges from a more general top level shown in block diagram form down to a very detailed level of schematic diagrams with actual commercially available IC components and actual wire interconnections between numbered pins on the IC components. The details continue down to the sub-component level of detail. The sub-component details include the schematic diagrams and design details of the commercially available IC components that are incorporated-by-reference from the Motorola Schottky TTL Data book and include the design details of the commercially available computer, disk drives, display monitor, printers, and other devices that are disclosed in the manuals that are incorporated-by-reference.

The end-to-end format ranges from input circuits at the front-end to output circuits at the back-end and includes in detail the in between software and circuits (such as the processors, memories, and digital filters).

The top-down format is consistent with the guidance provided by the Federal Circuit.

DeGeorge not only disclosed the TCCPI circuit in **block diagram format** in the ‘670 application but also disclosed it in **detailed schematic format** within the same disclosure, together with an **extensive verbal description**...

We conclude that the enablement requirement of §112 was satisfied by disclosure of detailed, *claimed* TCCPI circuitry without requiring detailed disclosure of all related, *unclaimed* circuitry with which the TCCPI might be interfaced.

DeGeorge.⁹ Similarly, the Appellant “not only disclosed the [inventions] in block diagram format ... but also disclosed it in detailed schematic format within the same disclosure, together with an extensive verbal [written] description”

System block diagrams are shown in Figs 1A, 1P, and 6A with various blocks that are shown in greater detail in other figures and verbally described in detail in the specification.

Regarding Fig. 1A, many of the blocks shown in Fig. 1A are expanded to provide greater detail in Figs. 1C-1G and are verbally described in detail in the specification. Additional details of many of the blocks shown in Fig. 1A are provided in indented outline format in the “Modular Configuration Features Table” (Spec. at 24-30). Effectively, the more detailed block diagrams in Figs. 1C-1G are disclosed as fitting within the corresponding blocks in Fig. 1A and the more detailed functions in the “Modular Configuration Features Table” are disclosed as fitting within the corresponding blocks in Fig. 1A.¹⁰

... where **Fig 1A** is a block diagram representation of one configuration of the system of the present invention; Fig 1B is a block diagram of a geometric module configuration; **Fig 1C** is a block diagram of a single channel configuration of one configuration of the present invention **in accordance with a reduced implementation of Fig 1A**; **Fig 1D** is a block diagram of a geometric processor module **in accordance with Fig 1A**; **Fig 1E** is a block diagram of a spatial processor module **in accordance with Fig 1A**; **Fig 1F** is a block diagram of input sources, input interfaces, and input multiplexers/demultiplexers **in accordance with Fig 1A**; Fig 1G is a block diagram of an output interface, output multiplexers/demultiplexers, and output devices **in accordance with Fig 1A**;

The block diagram shown in **Fig 1A** illustrates the modular expandability of the system of the present invention, **shown in greater detail in Figs 1B to 1G**.

⁹ DeGeorge v. Bernier, 768 F.2d 1318, 226 USPQ 758, 762-763 (Fed. Cir. 1985) (emphasis added).

¹⁰ Spec. at 5, 17, 17; respectively (emphasis added).

One general purpose modular configuration is shown in **Figs 1A to 1G** and summarized in the **MODULAR CONFIGURATION FEATURES TABLE** herein.

Regarding Fig. 1P; an input device 115A is shown in block diagram form in Fig. 1P, is shown in very detailed schematic form in Figs. 6U-6V, and verbally described in detail in the specification; an address generator 115B is shown in block diagram form in Fig. 1P, is shown in very detailed schematic form in Figs. 6O-6R, and is verbally described in detail in the specification; a memory 115C is shown in block diagram form in Fig. 1P, is shown in very detailed schematic form in Figs. 6E-6N, and is verbally described in detail in the specification; a buffer 115D is shown in block diagram form in Fig. 1P, is shown in very detailed schematic form in Figs. 6X-6AF, and is verbally described in detail in the specification; and an output device 115E is shown in block diagram form in Fig. 1P, is shown in very detailed schematic form in Figs. 6S and 6T, and is verbally described in detail in the specification.

Regarding Fig. 6A; control logic 610B is shown in block diagram form in Fig. 6A, is shown in very detailed schematic form in Figs. 6B-6D, and is verbally described in detail in the specification; address generators 610C are shown in block diagram form in Fig. 6A, are shown in very detailed schematic form in Figs. 6O-6R, and are verbally described in detail in the specification; memory 610D is shown in block diagram form in Fig. 6A, is shown in very detailed schematic form in Figs. 6E-6N, and is verbally described in detail in the specification; and buffer 610E is shown in block diagram form in Fig. 6A, is shown in very detailed schematic form in Figs. 6X-6AF, and is verbally described in detail in the specification.

Intermediate level figures are provided to further disclose the invention. For example, Fig. 2M provides intermediate level detail¹¹ to further illustrate the address generator block 115B and the memory block 115C (Figs. 1P and 2M). Other figures (e.g., Fig. 5A, 5D, 6A, and 6E) also provide various intermediate levels of detail.

The figures are verbally described in detail in the extensive disclosure comprising over 600 pages of verbal description and figures. The sections of the specification and the figures are functionally

¹¹ Fig. 2M is intermediate between the block diagram of an address generator 115B and a memory 115C in Fig. 1P and the detailed schematics of an address generator in Figs. 6O-6R and a memory in Figs. 6E-6N.

grouped together. For example, the section entitled Address Generators (Spec. at 319-328) discusses the detailed schematic diagrams related to the address generator figures (Figs. 6O-6R). The disclosure is outlined with the Table of Contents (Section 9.1).

The level of detail is illustrated by the disclosure of an “experimental system” that was actually reduced-to-practice (e.g., Spec. at 240-373 and 544-574 and Figs. 6A-6AH and 7D) and is disclosed in detail; including highly detailed schematic diagrams down to the individual component and individual wire level of detail (e.g., Figs. 6B-6D), detailed verbal descriptions thereof down to the individual component and individual wire level of detail (e.g., Spec. at 240-373), cable wire lists (e.g., Spec. at 503-521), IC component (DIP) location on circuit boards (e.g., Spec. at 522-543), and actual Basic¹² program listings (source code listings) with computer instructions and detailed annotations (e.g., Spec. at 544-574). See Section 5.7.

¹² “Basic” is a higher level computer language, available in both a compiler and an interpreter.

The Table of Contents (Section 9.1) provides a top-down road map (an indented outline) of the sections in the disclosure. Top-tier sections include:

GRAPHICS PROCESSOR
 SPATIAL FILTERING
 MEMORY ARCHITECTURE
 BUFFER MEMORY
 EXPERIMENTAL SYSTEM

middle-tier sections (indented) for the top-tier EXPERIMENTAL SYSTEM section include:

EXPERIMENTAL SYSTEM ARCHITECTURE¹³
 LOGIC BOARD
 MEMORY BOARDS
 BUFFER BOARD
 REAR-END BOARD
 CIRCUIT SPECIFICATIONS

and lower-tier sections (further indented) for the middle-tier EXPERIMENTAL SYSTEM ARCHITECTURE section include:

General Description¹⁴
 Supervisory Processor Interface
 Image Loading
 Software
 Description of DIS.ASC Listing
 Circuit Boards
 Cable List
 S-100 Bus System

The section in the specification entitled Brief Description of the Drawings (Spec. at 5-14) provides another type of top-down list of the disclosure. For example, Fig. 6A is identified as “a block diagram” and Fig. 6B is identified as “a detailed schematic diagram” (Spec. at 7).

In addition, detailed tables of cabling and component placement (Spec. at 503-543) and computer source programs (Spec. at 544-574) are disclosed.

¹³ This is the second indented tier in the Table of Contents.

¹⁴ This is the third indented tier in the Table of Contents.

5.7 THE DISCLOSED ACTUALLY REDUCED-TO-PRACTICE “EXPERIMENTAL SYSTEM” IS EXTENSIVELY DISCLOSED AND PROVIDES NUMEROUS “WORKING EXAMPLES”

The “experimental system” is an actual reduction-to-practice system that was actually constructed and operated. The “experimental system” included, for example, the computer, the computer programs, the computer interface, the address generators, the image memory, the buffer memory, the weight circuitry, the kernel circuitry, and the display monitor. The instant application, for example, discloses a computer¹⁵ filtering an image with a disclosed filter program¹⁶, overlaying graphics vectors into image memory with a disclosed program and initializing address generators and displaying an image with a disclosed program¹⁷. The instant application also discloses an image memory¹⁸ storing image information and being accessed by the address generators¹⁹; a buffer memory²⁰ buffering accessed image information; a weight circuit generating kernel weights²¹, a kernel circuit generating a kernel of image information²²; a display interface²³ generating display information; and a display monitor²⁴ displaying an image. All of these disclosures and much more are compatible and are combined in the “experimental system”.

The “experimental system” further implements an input arrangement.²⁵

¹⁵ E.g., Spec. at 155-60, 241-99, and 575-76 and element 610A in Fig. 6A.

¹⁶ E.g., Spec. at 161-180 and 561-566 and Fig. 7D.

¹⁷ E.g., Spec. at 155-60 and 544-60.

¹⁸ E.g., Spec. at 181-218 and 329-36, element 115C in Figs. 1P and 2M, element 610D in Fig. 6A, and Figs. 6E-6N.

¹⁹ E.g., Spec. at 319-28 and 115B in Figs. 1P and 2M, Figs. 4A and 4B, element 610C in Fig. 6A, and Figs. 6O-6R.

²⁰ E.g., Spec. at 219-39 and 337-65 and element 115D in Fig. 1P, element 610E in Fig. 6A, and Figs. 6W-6AF.

²¹ E.g., Spec. at 161-80, 363-65, and 561-66 and Figs. 5A, 5D, and 6AH.

²² E.g., Spec. at 161-80, 360-62, and 561-66 and Figs. 5A-5D and 6AG.

²³ E.g., Spec. at 366-71 and element 520 in Fig. 5A and Figs. 6S-6T.

²⁴ E.g., Spec. at 366-71, element 115E in Fig. 1P, output from element 610E in Fig. 6A, and Figs. 6S-6T.

²⁵ E.g., joysticks, Spec. at 366-71, element 115A in Fig. 1P, and Figs. 6U-6V.

The “experimental system” further implements an output arrangement.²⁶

The “experimental system” further implements a block memory with a detailed disclosure of a block having eight rows, eight columns, and 64 samples or pixels and an accessing or reading circuit and a writing circuit for the block memory.²⁷

The “experimental system” further implements memory address generators.²⁸

The “experimental system” further implements a computer with detailed disclosures of computer programs.²⁹

The “experimental system” further implements a spatial processor and a filter processor.³⁰

The “experimental system” further implements a graphic processor generating vector information.³¹

The “experimental system” further implements a kernel circuit including a kernel memory and a kernel processor.³²

The “experimental system” further implements a filter weight arrangement.³³

The Abstract prominently identifies the “experimental system” and states that it “is disclosed in detail” (emphasis added).

ABSTRACT

An improved image processing architecture is provided having advantages of increased speed, lower cost, extensive features and efficiency of implementation... An experimental system that

²⁶ E.g., a display monitor with a video interface, Spec. at 366-71, element 115E in Fig. 1P, output from element 610E in Fig. 6A, and Figs. 6S-6T.

²⁷ E.g., Spec. at 181-218 and 329-36, element 115C in Figs. 1P and 2M, element 610D in Fig. 6A, and Figs. 6E-6N.

²⁸ E.g., Spec. at 319-28 and 115B in Figs. 1P and 2M, Figs. 4A and 4B, element 610C in Fig. 6A, and Figs. 6O-6R.

²⁹ E.g., Spec. at 155-60, 241-47, and 544-74, 610A in Fig. 6A, and Fig. 7D.

³⁰ E.g., Spec. at 161-80 and 561-66 and Fig. 7D.

³¹ E.g., Spec. at 155-60, 544-60, and 567-574.

³² E.g., Spec. at 161-80, 360-65, and 561-66; and Figs. 5A-5D, 6AG, and 7D.

³³ E.g., Spec. at 161-80, 363-71, and 562 and Figs. 5A, 5D, 6AH, and 7D.

demonstrates many of the improved features has been constructed and is **disclosed in detail**.

The disclosure has more than 40 recitations of the term "experimental system" and terms related thereto.

The disclosure has more than 30 sheets of figures specifically directed to the actually reduced-to-practice "experimental system" (e.g., Figs. 6A-6AH).

The disclosure has more than 200 pages of verbal description directed to the actually reduced-to-practice "experimental system" (e.g., Spec. at 240-373 and 503-574).

The disclosure titles prominently emphasize the actually reduced-to-practice "experimental system" (emphasis added):

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EXPERIMENTAL CONFIGURATION FEATURES TABLE 33

The application even discloses cable lists and IC DIP component layout on circuit boards for the actually reduced-to-practice "experimental system" (Spec. at 510-543).

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The hardware and software of the actually reduced-to-practice "experimental system" is summarized in the disclosure (Spec. at 33):

EXPERIMENTAL CONFIGURATION FEATURES TABLE

Real time operation
Medium resolution (260,000-pixels per frame)
Dynamic updates at the field rate (60-times per second)
Interactive operation
Joysticks and computer commands
 X-axis translation
 Y-axis translation
 Rotation
 Expansion and compression
Instantaneous response

Simultaneous motion, all controls

Geometric processing

Rotation

Continuous

Resolution: 0.2-degrees

360-degrees/sec max rate

Software limited

Expandable

Translation

Continuous

Resolution: 1-pixel

1000-pixels/second max rate

Software limited Expandable

Expansion/compression

Continuous

Fractional (non-integer)

Resolution: 1-pixel

Double/half size per second max rate

Software stops

Expandable

Monitor

Barco color monitor.

Blanked to 484-lines and about 700-pixels/line

3-colors, RGB

13-inch CRT

Inline gun shadow mask

Image memory

512-pixels by 512-pixels

7-bits per pixel

2-bits red

2-bits blue

3-bits green

200-ns RAMs

Spatial filtering

9-pixel kernel at 10-million kernels/sec

Weight RAM

Virtual scrolling

Image memory wrap-around

Supervisory computer

8085 8-bit microcomputer

CP/M-80 operating system

Compiled Basic

Many other sections and the figures discussed therein teach features of the actually reduced-to-practice “experimental system”. For example, the sections listed in the table of contents (Section 9.1, excerpted below) supplement the above table of contents quotations with theory, analysis, and documentation related to the disclosed actually reduced-to-practice “experimental system”.

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| MEMORY TABLE-A | 536 |
| MEMORY TABLE-B | 538 |
| MEMORY TABLE-C | 540 |
| MEMORY TABLE-D | 542 |
| BASIC PROGRAM LISTING GRAPH.ASC | 544 |
| BASIC PROGRAM LISTING LD.ASC | 547 |
| BASIC PROGRAM LISTING FTR.ASC | 561 |
| BASIC PROGRAM LISTING DIS.ASC | 567 |

**5.8 EXCERPTED PASSAGES FROM THE SPECIFICATION THAT ARE CITED IN
TABLES 5.1 ET SEQ.**

Excerpts of the citations to the specification that are cited in the tables in Section 5.1 above are provided in the Table of Disclosure Excerpts below.

TABLE OF DISCLOSURE EXCERPTS

Page 4

The present invention is generally directed to improved processing systems and, in particular, provides improvements in memory, processor, software, and control architectures and in software and hardware designs. A system architecture is provided that provides flexibility, performance, and efficiency. A geometric processor is provided that implements rotation, translation, expansion, compression, warping, 3D-perspective, vector generation, and other features in a high performance and efficient manner; such as by using a window implementation and by providing the flexibility of software control. A spatial processor is provided that provides smoothing, anti-aliasing, and other features. Memory architectures and designs are provided that increase performance and efficiency, including a memory map and a buffer memory. Programs are provided that enhance flexibility and capability, yet preserve the high performance of the hardware.

Page 16

The image processor can be implemented in a range of configurations, including an image processing subsystem and an image processing system. One configuration is a multiple channel high resolution image processor. Various modules are discussed to accommodate different types of input and output interfaces and multiple channel capability. The various modules of the image processor permit implementation of a basic configuration and then permit modular expansion to a multi-channel system. Modularity permits the basic configuration to be implemented in multitudes of ways using such modules.

Page 17

The geometrically processed images can be combined with a geometric multiplexer/demultiplexer/combiner 110D. Multiplexing selects a particular geometric processed image channel for subsequent processing. Processing includes overlaying, adding, subtracting, and otherwise selecting and combining of images. For example, many channels of geometrically processed images 110C can be overlayed with occulting priorities.

Page 17

The processed and combined images can be demultiplexed with element 110D to route the appropriate images to the appropriate spatial modules 110E to 110F and for feedback to the geometric modules along path 110H.

Pages 18-19

A supervisory processor 110R provides supervisory operations; such as receiving external commands 110S for configuring the system. For example, geometric modules 110C can be controlled for different types of geometric processing with different geometric parameters; spatial modules 110G can be controlled for different types of weights loaded into weight RAMs; and the multiplexer/demultiplexer modules and combiner module 110I, 110N, and 110Q can be selected for multiplexing and demultiplexing of images.

Page 19

Geometric processor 110D operates under control of channel processor 111E to generate geometrically processed images from image memory 111C. Spatial processor 110E spatially processes the information from geometric processor Mux 110D to provide a spatially geometric processed image to the output image interface 111F.

Page 20

One configuration of the geometric module 111H is shown in block diagram form in Fig 1D. Image memory 111C receives image information from the input image interface for outputting to the spatial processor and to the output image interface under control of geometric processor 111D.

Pages 20-21

One configuration of spatial module 110E is shown in block diagram form in Fig 1E. It provides spatial processing of image information. In one configuration, image information is geometrically processed and loaded into a buffer memory, such as a multiple buffered 3-line buffer memory. The 3-line buffers load kernel registers 111J for parallel generation of a 9-pixel kernel. A weight RAM 111M is loaded with weights from the supervisory processor for the desired spatial processing. Multipliers 111K and summers 111L multiply the appropriate weights from weight RAM 111M with the corresponding intensities from kernel registers 111J to obtain weighted intensities and sum these weighted intensities to get a single weighted intensity for output to the output image interface. Sum of the products processing can provide intensity resolution enhancement and spatial resolution enhancement.

Page 21

Digital input images 112H can be obtained from digital database memories, digital front end sources 112J, and as feedback from other parts of the system 112K; such as from the geometric modules and spatial modules.

Page 22

One configuration of an output arrangement is shown in Fig 1G. The spatial multiplexer/demultiplexer 113A can route a plurality of the spatial processor (or geometric processor) image channels to a plurality of output devices 113G to 113L under control of the supervisory processor. Digitally processed image information can be routed directly to digital devices 113K to 113L, such as a pattern recognition processor or artificial intelligence processor or a digital database memory. Digitally processed image information can also be routed to analog devices 113G to 113J through RGB video digital-to-analog converters (DACs). RGB video signals can be converted to composite video signals with converters 113E to 113F for output devices that operate on composite signals 113I to 113J. Output devices that operate on RGB video and composite video signals include video tape recorders, video monitors, and other video output devices. Alternately, video output signals, digital or analog, can be fed-back to the input interface for recirculating through the image processor.

Page 27**III. (Continued)****C. Image memory**

1. 512-by-512 pixels/block
 - a. Expandable in blocks
 - b. Maximum configuration: 4096-by-4096 pixels
2. Input and output
 - a. Raster scan: 30 frames/sec max
 - 1) 13-million pixels/sec max
 - b. Random access: 13-million pixels/sec max
 - c. Sequential access, along a vector
 - 1) Start address

- 2) Pixel words
 - d. Memory to memory transfers
 - e. Processed image to memory
- 3. Pixel latitude
 - a. DAC configuration is a function of option
 - b. Pixel byte: 8-bits per pixel, expandable
 - c. Color: RGB
 - 1) Bits per pixel: T (where $A+B+C=T$, with jumpers)
 - a) Red: A
 - b) Green: B
 - c) Blue: C
 - d. Color lookup table
 - 1) Input bits per pixel (table input): 8, expandable
 - 2) Output Bits per pixel (table output): 8, expandable
 - 3) Pallet: ROM or S/W load of RAM
 - e. Monochrome
 - 4) Bits per pixel: 8
 - f. Expandable in 8-bit per pixel bytes
 - 1) Maximum configuration: 24-bits per pixel

Page 31

Geometric processor 120E can translate, rotate, compress, and expand the image from image memory 120D. The processed image is scanned out to display monitor 120H through digital to analog converter (DAC) 120G. Timing and control circuitry 120J provides timing and control signals; such as clock signals, horizontal synchronization signals, and vertical synchronization signals; for control of system operations.

* * *

As an alternate to direct scanout from geometric processor 120E, a refresh memory 120F can be used as an interface memory between geometric processor 120E and display monitor 120H. Alternately, refresh memory 120F can be eliminated, where geometric processor 120E can generate digital pixel information directly to DAC 120G for refreshing of display monitor 120H.

Page 38

A hierarchical memory map architecture can be used; comprising database memory 131B, image memory 131D, and refresh memory 131K. database memory 131B can be implemented to contain large amounts of high detail information in memory map form, which can be selectively accessed for loading into image memory 131D.

Page 39

A video disk can store about 50,000 mosaic frames (about 10- billion pixels) per side. The frames can be stored having the highest spatial resolution that is required, then can be spatially compressed with image processor 131E to form an image suitable for the particular display scenario. For example, in a flight simulator application, frames can be stored for the highest zoom magnification and lowest aircraft altitude required, then can be spatially compressed to the lower zoom magnification and the higher aircraft altitude as they vary through the dynamic simulation scenario.

Page 39

Image processor 131E can access static area information from image memory 131D to transform this static information to real time dynamic geometric information for loading into

refresh memory 131L image processor 131F can translate, rotate, warp, spatially compress, and otherwise transform the static area information in order to provide the appearance of dynamic motion.

Pages 41-42

In a digital image processor configuration, digital processing can be implemented in special purpose or general purpose forms. Special purpose logic, such as digital differential analyzers (DDAs), can provide rotation, translation, spatial compression, and other processing. General purpose processors, such as a stored program computer and a microcomputer, can be used for a software implementation and a firmware implementation respectively. For example, an AMD 2900 bit-slice microprocessor can be used for a firmware implementation.

Page 48

The dynamic memory and refresh memory combination can be implemented with a double buffered refresh memory, where an old image is being used to refresh the display while a new image is being transformed from the image memory.

Page 48

The dynamic memory and refresh memory combination can be implemented with a double buffered refresh memory, where an old image is being used to refresh the display while a new image is being transformed from the image memory.

Page 49

One form of this arrangement will be characterized as transferring memory map information from a first memory to a second memory and transforming the nature of the memory map information; such as with translation, rotation, and spatial compression; during the transfer. Edge processing may be performed by selectively accessing pixels from the input memory map and selectively storing these pixels in the output memory map; where the selection of the input and output pixels facilitates image processing.

Page 54

An aircraft map following navigation application will now be discussed to illustrate use of the arrangement discussed with reference to Fig 1L. This application presents a dynamic map display from a pre-mapped recorded database for aiding in navigation. An image of the terrain below an airplane is stored in memory map form in input memory 132B. This can be a prerecorded image stored in database and loaded into input memory 132B. The database may be self contained in the system or may be transmitted from a remote source.

Page 64

Many different input sources and output destinations can be provided. Input sources can be image sensors, image generators, memories, other image processing systems, digitizers, communication links, and multitudes of other input sources. Output destinations can be display monitors, pattern recognition devices, artificial intelligence devices, memories, other image processing systems, communication links, and multitudes of other output destinations.

Page 71

Geometric processing has previously been discussed in the form of an address generator that generates the addresses of pixels having a geometrically processed relationship therebetween, such as having a rotated and expanded relationship therebetween. Such address generation is discussed as being accompanied by read operations of the image memory for scanning out the addressed

pixels. This address generator can be adapted for geometric preprocessing to scan a geometrically preprocessed image into image memory by generating the geometric processing related addresses accompanied by write operations (in place of the above-mentioned read operations) for writing pixels into image memory in geometrically processed form. Therefore, geometric preprocessing can be implemented with an arrangement similar to that discussed for geometric postprocessing.

Page 94

The initial point can be derived in response to translation processing, such as by adding the changes in translational position to the coordinates of the prior initial point to obtain the coordinates of the next initial point. The slopes of column pixels 205C and row lines 205E (Fig 2B) can be derived in response to rotation processing, such as by adding the changes in rotational position to the prior rotational position to obtain the next rotational position.

Page 95

Therefore, the frame sync pulse can be used to control loading of initial conditions for next frame inbetween completion of the prior frame and initiation of the next frame.

Page 102

Image Compression can be implemented with sub-pixel spatial sampling. For example, for an image zoomed to half-size, each other pixel in a scanline can be sampled and each scanline can be spaced 2-pixels apart. In an alternate arrangement, the array is scanned to the desired degree of compression and new pixel intensities are created that are a weighted and mixed combination of adjacent pixels. Weighting and mixing reduces loss of information; reduces erroneous visual effects; and permits fractional, non-integer, compression.

Image compression can be implemented by generating scanlines that are further apart than the pixel spacing and by mixing weighted pixel intensities to interpolate scanline positions between pixel coordinates. Scanline spacing can be generated to subpixel resolution with the incremental-type address generators shown in Fig 2I. Remainder registers can be used to define fractional portions of a pixel position and consequently can be used to determine subpixel weights. Alternately, scanline spacing can be generated to sub-pixel resolution and the sub-pixels that are traversed can be used to define the weights. Image compression can be implemented as a separate operation, separate from other image processing operations. This can be implemented with separate dedicated address generators scanning a memory map to the desired compressed spacing. During scanning, pixel intensities can be weighted and mixed to interpolate between actual pixel intensities to obtain the compressed pixel intensities to sub-pixel resolution.

Pages 106-107

Image expansion can be implemented by generating scanlines that are closer together than the pixel spacing and by mixing weighted pixel intensities to interpolate scanline positions between pixel coordinates. Scanline spacing can be generated to subpixel resolution with the incremental-type address generators shown in Fig 2F. Remainder registers can be used to define fractional portions of a pixel position and consequently can be used to determine subpixel weights. Alternately, scanline spacing can be generated to sub-pixel resolution and the sub-pixels that are traversed can be used to define the weights.

Image expansion can be implemented as a separate operation, separate from other image processing operations. This can be implemented with separate dedicated address generators scanning a memory map to the desired expanded spacing. During scanning, pixel intensities can be weighted and mixed to interpolate between actual pixel intensities to obtain the expanded pixel intensities to sub-pixel resolution.

Page 143

The +X, -X, -Y, and +Y commands are translation acceleration commands; incrementing and decrementing the X-delta and Y-delta velocity parameters in response to key actuation. The +angle and -angle commands are rotation acceleration commands; incrementing and decrementing the angle delta velocity parameter in response to key actuation. The expansion and compression commands are scale factor products, decreasing and increasing the image scale factor respectively by a predetermined factor in response to key actuation.

Page 144

The +X, -X, +Y, and -Y commands are translation velocity commands; updating the X and Y position parameters in response to joystick commands. The +angle and -angle commands are rotation velocity commands; updating the angle parameter in response to the joystick commands. The expansion and compression commands are scale factor products, updating the image scale factor by a factor related to the magnitude of the joystick command.

Pages 144-145

The +X, -X, +Y, and -Y commands are translation velocity commands; updating the X and Y position parameters in response to joystick commands. The +angle and -angle commands are rotation velocity commands; updating the angle parameter in response to the joystick commands. The expansion and compression commands are scale factor products, updating the image scale factor by a factor related to the magnitude of the joystick command.

Page 158

The vector memory can contain the start point coordinates and the vector deltas for the address generators and a quantity parameter or distance-to-go (DTG) parameter related to the quantity of vector steps to be generated for the particular vector.

Page 184

A multi-dimensional address configuration is shown in Fig 2. Address generator 115B generates an address word having a re- addressing portion 215E, a Y-scanout portion, 215G, and an X- scanout portion 215F. This arrangement has particular advantages because the X-scanout signal 215F and the Y-scanout signal 215G can be generated more rapidly than re-addressing signal 215E to access or to write into memory 115C.

Page 197

Each of the 4096-blocks of pixels can be configured in an 8- by-8 array of 64-pixels. One of the 8-by-8 arrays of 64-pixels is shown in the image memory diagrams and tables included herewith. The 8-by-8 array can be addressed with a 2-dimensional 3-bit by 3-bit address organized in a 3-bit X-address and a 3-bit Y- address format.

Page 243

Synchronization signals include a frame synchronization signal and a line synchronization signal. The frame synchronization signal occurs during vertical retrace and vertical blanking of the video signal. The line synchronization signal occurs during horizontal retrace and horizontal blanking of the video signal. An interlaced scan arrangement is used for the experimental system, although other scan arrangements can readily be accommodated. A field identification signal is provided that identifies whether the field is a first field or a second field of the interlaced scan.

Page 247

The BASIC PROGRAM LISTING LD.ASC provided herein teaches loading of vectors into memory. The BASIC PROGRAM LISTING GRAPH.ASC provided herein teaches refreshing of a CRT monitor from memory. These listings are clearly coded and amply annotated

to teach one skilled in the art how to operate the experimental system disclosed herein under program control.

Page 248

Description of DIS.ASC Listing

One configuration of the system of the present invention is implemented with a computer executing a program, shown in the BASIC PROGRAM LISTING DIS.ASC provided herein, once per field to load initial conditions into the geometric processor. This program generates initial conditions for the iterative processing and then iteratively generates conditions for the geometric processor. The iterative processing is performed once per field. It is implemented with multiple field interpolation which generates the initial conditions for an 8-field period and then interpolates inbetween the 8-field period to obtain the initial conditions for each field. This may be considered to be a temporal domain interpolation, in contrast to spacial domain interpolation; where temporal domain interpolation interpolates the initial conditions between temporally sequential fields rather than spatially within a field.

Page 285

The scale factor square-law command is scaled with a small number, 0.00001, and added to unity to provide an offset binary scale factor. Unity scale factor provides no change in size. Hence, adding the scaled offset binary scale factor command to unity provides a slightly greater than unity scale factor or a slightly less than unity scale factor for positive or negative zoom.

Page 388

A large number of textured overlays can be provided. Each textured overlay can be independently processed for geometric operations including rotation, translation, scaling, 3D-perspective, and warping; cropped to irregular external and even internal features; and overlaid with a background image and with other overlay images using occulting priorities on a pixel-by-pixel basis. This provides high detail occulting between irregular textured images for high detail interaction in real time.

Textured overlays can be cropped to irregular external and internal features; i.e., a tree has an external outline defined by the external leaf and branch outline and has internal spaces between leaves and branches. Textured overlaying can be performed to pixel resolution and pixel detail based upon occulting priorities. Therefore, a tree image can be oriented, positioned, scaled, warped and overlaid on a background image; occulting the background image, occulting portions of more remote objects, and being occulted by portions of nearer objects. Moving occulted features can be seen between the cropped portions of occulting overlays; i.e., a partially occulted tank image can be seen between the leaves of an occulting tree image as it moves behind the tree image and can be seen as it moves past the external outline of the tree image.

Page 401

Overlaying of images, as discussed above, is illustrative of other image interaction processing. For example, different images can be arithmetically combined, logically combined, and otherwise combined in addition to overlaying. Arithmetic combination includes adding, subtracting, multiplying, dividing, and other arithmetically combining intensities. Logical combination includes ANDing, ORing, XORing, AND/ORing, and other logically combining intensities. Because pixels are scanned out sequentially; combining intensities; such as overlaying, arithmetically combining, and logically combining intensities; can be performed on a pixel pair by pixel pair basis. Consequently, such combining can be implemented with a single

one of each of the different combining circuits; such as a single set of adder, subtracter, multiplier, divider, and logical arrangements.

Page 497

There are various types of edge detection, such as for pattern recognition and image enhancement. These include convolution and shift and subtraction.

Page 499

Operation may be enhanced by selecting different resolutions for different modes of operation. For example, reduced resolution can provide more rapid image processing and improved utilization of image processing resources. Reduced resolution image processing can be performed over a larger image area, such as for coarse alignment, and increased resolution image processing can be performed over a more limited image area, such as for fine alignment of coarse aligned image features. For example, coarse alignment can cover a greater spatial range, because the images may initially be widely misaligned, and fine alignment can cover a lower spatial range, because the images may have already been coarse aligned with a coarse alignment operation. Therefore, coarse alignment may require greater spatial range, but to lesser spatial resolution, and fine alignment may require smaller spatial range, but to greater spatial resolution.

Page 562

```
390   WTS1%=W1%+W2%+W3%+W4%+W5%+W6%+W7%+W8%+W9%'WEIGHT SCALE
FACTOR
400   WTS2=1/WTS1%'RECIPROCAL WEIGHT SCALE FACTOR
```

Page 567

```
200   PRINT: PRINT: PRINT "FILE: DIS.ASC, REV. 10/7/4 19:00"
220   'ADDED ANNOTATIONS AND DELETED UNNECESSARY MATERIAL
240   CLEAR
260   INPUT "MURPHY (M) OR CAMILLE (C)";K2$'SELECT SYSTEM configuration
280   PRINT: PRINT "JOYSTICK BIAS VALUES" 'CALIBRATE JOYSTICKS
300   E%=0
320   FOR A%=2 TO 8 STEP 2: B%=A%_2: OUT 236,B%: C%=INP (237): GOSUB 440
340   NEXT A%
360   IF K2$="C" THEN 400
380   A8%=INP (1): GOTO 420 'KEYBOARD EXIT OF JOYSTICK CALIBRATE
400   A8%=INP (93)
420   A8%=A8% AND 2: IF A8%=0 THEN 320 ELSE 660
440   '*****
460   'SUBROUTINE TO ACQUIRE JOYSTICK VALUES
480   D%=A%/2: ON D% GOTO 500,520,540,580
500   PRINT "SCALE=";C%,: BS5%=C%: GOTO 620
520   PRINT "X=" ;C%,: BX5%=C%: GOTO 620
540   PRINT "ANGLE=";C%,: BA5%=C%: GOTO 620
580   PRINT "Y=" ;C% : BY5%=C%
600   PRINT CHR$(11);
620   RETURN
```

6 GROUND OF REJECTION TO BE REVIEWED ON APPEAL

The grounds of rejection to be reviewed on appeal are as follows:

- a) Whether claims 105-173, 187-281, 301, 380-383, 385-416, 418-583 are unpatentable under 35 USC 112 first paragraph (§ 112-1) for lack of written description?
- b) Whether claims 105-173, 187-281, 301, 380-383, 385-416, 418-583 are unpatentable under 35 USC 112 first paragraph (§ 112-1) for lack of enablement?
- c) Whether claims 187, 209, 235 and 279 are anticipated by Netravali et al. (4,245,248) under 35 USC 102(b) (§102)?
- d) Whether claim 472 is anticipated by Grumet (4,601,053) under 35 USC 102(e) (§102)?
- e) Whether claims 117, 148, 151, 173, 217, 229 and 385 are anticipated by Meagher (4,694,404) under 35 USC 102(e) (§102)?
- f) Whether claims 231, 388 and 527 are anticipated by Rogoff et al. (4,590,569) under 35 USC 102(e) (§102)?
- g) Whether claims 137, 153, 249 and 579 are anticipated by Sacks et al. (4,736,437) under 35 USC 102(e) (§102)?
- h) Whether claim 105 is anticipated by Taylor et al. (4,563,703) under 35 USC 102(e) (§102)?

- i) Whether claims 115, 127 and 380, as well as the remaining pending claims, are anticipated by Tescher et al. (4,541,012) under 35 USC 102(e) (§102)?
- j) Whether claims 113, 125, 127, 198, 223, 238 and 261, as well as the remaining pending claims, are anticipated by Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) under 35 USC 102(b) (§102)?
- k) Whether claims 105-108, 118, 119, 123, 124, 126, 135, 137, 143, 145, 148, 153, 157, 188, 189, 197, 201, 203, 204, 206, 212, 214, 215, 218, 228, 231, 249, 255, 264, 267, 388, 525, 527, 533, 535, 539, 553, 555, 557, 559, 561, 564, 573, 575, 578 and 580 are anticipated by Fant (4,835,532) under 35 USC 102(e) (§102)?
- l) Whether claims 244, 245, 262 and 381 are unpatentable under 35 USC 103(a) (§ 103) over Jain et al., Displacement Measurement and Its Application in Interframe Image Coding, as applied to claims above, and further in view of Tiemann (4,375,650)?
- m) Whether claim 143 is unpatentable under 35 USC 103(a) (§ 103) over Sacks et al. (4,736,437) and Pincoffs et al. (3,638,188)?
- n) Whether claims 116, 131, 149, 166, 226 and 301, as well as their corresponding dependent claims, are unpatentable under 35 USC 103(a) (§ 103) over Fant (4,835,532) and Maguer et al. (3,967,233)?
- o) Whether claim 167, as well as its corresponding dependent claims, are unpatentable under 35 USC 103(a) (§ 103) over Fant (4,835,532), Maguer et al. (3,967,233) and Cleminson (4,675,829)?

- p) Whether claims 120, 207, 232, 381 and 571, as well as their corresponding dependent claims, are unpatentable under 35 USC 103(a) (§ 103) over Fant (4,835,532) and Tescher (4,541,012)?
- q) Whether claim 211, as well as its corresponding dependent claims, are unpatentable under 35 USC 103(a) (§ 103) over Fant (4,835,532), Tescher (4,541,012) and Taylor et al. (4,563,703)?
- r) Whether claims 556 and 572, as well as their corresponding dependent claims, are unpatentable under 35 USC 103(a) (§ 103) over Fant (4,835,532), Tescher (4,541,012) and Mosier (4,583,094)?
- s) Whether claim 567, as well as its corresponding dependent claims, is unpatentable under 35 USC 103(a) (§ 103) over Fant (4,835,532), Tescher (4,541,012) and Sidoti (3,885,325)?
- t) Whether claims 139, 196, 252, 422, 427, 558, 568, 570, 574 and 582, as well as their corresponding dependent claims, are unpatentable under 35 USC 103(a) (§ 103) over Fant (4,835,532) and Mosier (4,583,094)?
- u) Whether claims 274, 552 and 577, as well as their corresponding dependent claims, are unpatentable under 35 USC 103(a) (§ 103) over Fant (4,835,532), Mosier (4,583,094) and Cleminson (4,675,829)?
- v) Whether claims 536, 554 and 563, as well as their corresponding dependent claims, are unpatentable under 35 USC 103(a) (§ 103) over Fant (4,835,532), Mosier (4,583,094) and Tabata et al. (4,574,364)?
- w) Whether claim 147, as well as its corresponding dependent claims, are unpatentable under 35 USC 103(a) (§ 103) over Fant (4,835,532) and Tabata et al. (4,574,364)?

- x) Whether claims 195 and 219, as well as their corresponding dependent claims, are unpatentable under 35 USC 103(a) (§ 103) over Fant (4,835,532), Tabata et al. (4,574,364) and Taylor et al. (4,563,703)?
- y) Whether claim 583, as well as its corresponding dependent claims, are unpatentable under 35 USC 103(a) (§ 103) over Fant (4,835,532), Tabata et al. (4,574,364) and Sidoti (3,885,325)?
- z) Whether claims 159, 161, 163, 165 and 193, as well as their corresponding dependent claims, are unpatentable under 35 USC 103(a) (§ 103) over Fant (4,835,532) and Cleminson (4,675,829)?
- aa) Whether claim 569, as well as its corresponding dependent claims, are unpatentable under 35 USC 103(a) (§ 103) over Fant (4,835,532), Cleminson (4,675,829) and Sidoti (3,885,325)?
- bb) Whether claims 190, 258, 276, 515, 549, 550, 562, 565 and 581, as well as their corresponding dependent claims, are unpatentable under 35 USC 103(a) (§ 103) over Fant (4,835,532) and Sidoti (3,885,325)?
- cc) Whether claims 551, 560 and 576, as well as their corresponding dependent claims, are unpatentable under 35 USC 103(a) (§ 103) over Fant (4,835,532), Sidoti (3,885,325) and Lam et al. (4,576,577)?
- dd) Whether claim 398, as well as its corresponding dependent claims, are unpatentable under 35 USC 103(a) (§ 103) over Fant (4,835,532) and Lam et al. (4,576,577)?

- ee) Whether claim 133, as well as its corresponding dependent claims, are unpatentable under 35 USC 103(a) (§ 103) over Meagher (4,694,404) and Tucker (4,546,433)?
- ff) Whether claim 169, as well as its corresponding dependent claims, are unpatentable under 35 USC 103(a) (§ 103) over Meagher (4,694,404) and Cleminson (4,675,829)?

7 ARGUMENT

7.1 ARGUMENTS REGARDING EACH OF THE CLAIMS AND EACH OF THE REJECTIONS

7.1.1 Arguments Regarding The 35 USC 112-1 Written Description Rejection

Independent claim 105 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 224, 227, 248, and 400 depending from claim 105 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 106 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 230, 250, 251, and 409 depending from claim 106 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 107 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 451, 463, 464, and 466 depending from claim 107 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 108 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claim 454 depending from claim 108 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 109 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 110, 112, 389, 497, 543, and 547 depending from claim 109 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 113 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 114 and 403 depending from claim 113 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 115 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 406, 407, and 499 depending from claim 115 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 116 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 117 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 118 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 119 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 120 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claim 457 depending from claim 120 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 121 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 122 and 396 depending from claim 121 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 123 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 253, 254, and 266 depending from claim 123 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 124 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 467 and 468 depending from claim 124 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 125 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 130, 411, and 501 depending from claim 125 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 126 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 127 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 129, 412, 414, and 502 depending from claim 127 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 128 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 132 and 134 depending from claim 128 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 131 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 133 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 135 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 136 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claim 138 depending from claim 136 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 137 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 278 and 386 depending from claim 137 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2

- 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 139 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 140 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claim 144 depending from claim 140 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 141 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 142 and 405 depending from claim 141 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 143 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 415, 419, 420, and 505 depending from claim 143 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 145 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 146 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 147 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 148 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 149 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 150 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 151 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 152 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 153 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 154 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 155 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 156 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 157 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 158 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 160, 162, 164, 168, 170, 191, 192, 194, 202, 205, 208, 210, and 213 depending from claim 158 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 159 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 393, 399, 401, and 548 depending from claim 159 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 161 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 423, 424, 425, and 509 depending from claim 161 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and

in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 163 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 428, 430, and 507 depending from claim 163 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 165 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 166 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 167 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 169 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 171 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 172, 421, 429, 431, and 437 depending from claim 171 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 173 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 187 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 432, 434, and 445 depending from claim 187 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 188 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 189 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 190 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 443 and 544 depending from claim 190 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 193 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 195 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 426 and 510 depending from claim 195 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 196 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 197 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 402, 404, and 408 depending from claim 197 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 198 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 199 and 200 depending from claim 198 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 201 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 444 and 446 depending from claim 201 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 203 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 435, 436, and 438 depending from claim 203 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 204 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 410, 413, 416, and 447 depending from claim 204 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 206 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 487, 488, and 490 depending from claim 206 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 207 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 209 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 449 and 450 depending from claim 209 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2

- 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 211 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 212 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 440, 441, and 442 depending from claim 212 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 214 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 215 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 216, 221, and 222 depending from claim 215 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 217 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 218 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 219 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claim 220 depending from claim 219 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 223 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 225, 234, 459, 460, 461, and 545 depending from claim 223 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 226 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claim 462 depending from claim 226 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 228 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 229 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claim 465 depending from claim 229 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8.

Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 231 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 232 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 233, 469, 470, 479, and 493 depending from claim 232 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 235 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 236, 237, 471, and 473 depending from claim 235 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 238 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 239, 240, and 475 depending from claim 238 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 241 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 242, 243, 477, and 478 depending from claim 241 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 244 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 245, 246, 247, and 480 depending from claim 244 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 249 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 252 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 255 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 256, 257, and 486 depending from claim 255 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 258 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 259, 260, and 546 depending from claim 258 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections

5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 261 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 262, 263, 433, 492, and 494 depending from claim 261 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 264 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 265, 268, 269, and 495 depending from claim 264 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 267 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claim 498 depending from claim 267 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 270 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 271, 272, 496, and 500 depending from claim 270 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and

in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 273 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 275, 439, and 503 depending from claim 273 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 274 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 276 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 277 and 506 depending from claim 276 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 279 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 280, 281, 452, and 508 depending from claim 279 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 301 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 380 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 381 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 382 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 383 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 385 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claim 387 depending from claim 385 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 388 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claim 476 depending from claim 388 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 390 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 391, 392, and 394 depending from claim 390 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 395 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claim 397 depending from claim 395 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 422 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 427 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 448 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 455 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claim 474 depending from claim 455 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 472 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 485 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claim 484 depending from claim 485 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 511 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claim 512 depending from claim 511 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 513 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claim 514 depending from claim 513 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 515 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claim 516 depending from claim 515 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8.

Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 517 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claim 518 depending from claim 517 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 519 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claim 520 depending from claim 519 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 521 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claim 522 depending from claim 521 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 523 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claim 524 depending from claim 523 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8.

Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 525 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claim 526 depending from claim 525 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 527 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claim 528 depending from claim 527 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 529 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claim 530 depending from claim 529 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 531 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claim 532 depending from claim 531 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8.

Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 533 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 111, 418, 491, 504, and 534 depending from claim 533 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 535 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 453, 456, and 458 depending from claim 535 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 536 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 537 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claim 538 depending from claim 537 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 539 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 481, 482, 483, and 540 depending from claim 539 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 541 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claim 542 depending from claim 541 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 549 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 550 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 551 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 552 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 553 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 554 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 555 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 556 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 557 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 558 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 559 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 560 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 561 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 562 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 563 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 564 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 565 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 566 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 567 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 568 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 569 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 570 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 571 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 572 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 573 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 574 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 575 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 576 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 577 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 578 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 579 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 580 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 581 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 582 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Independent claim 583 finds written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

Dependent claims 543, 544, 545, 546, 547, and 548 find written restriction in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the written restriction rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.4.

7.1.2 Arguments Regarding The 35 USC 112-1 Enablement Rejection

Independent claim 105 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 224, 227, 248, and 400 depending from claim 105 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 106 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 230, 250, 251, and 409 depending from claim 106 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 107 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 451, 463, 464, and 466 depending from claim 107 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 108 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claim 454 depending from claim 108 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 109 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 110, 112, 389, 497, 543, and 547 depending from claim 109 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 113 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 114 and 403 depending from claim 113 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 115 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 406, 407, and 499 depending from claim 115 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 116 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 117 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 118 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 119 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 120 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claim 457 depending from claim 120 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 121 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 122 and 396 depending from claim 121 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 123 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 253, 254, and 266 depending from claim 123 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 124 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 467 and 468 depending from claim 124 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 125 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 130, 411, and 501 depending from claim 125 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 126 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 127 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 129, 412, 414, and 502 depending from claim 127 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 128 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 132 and 134 depending from claim 128 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 131 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 133 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 135 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 136 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claim 138 depending from claim 136 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections

5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 137 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 278 and 386 depending from claim 137 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 139 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 140 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claim 144 depending from claim 140 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 141 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 142 and 405 depending from claim 141 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 143 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 415, 419, 420, and 505 depending from claim 143 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 145 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 146 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 147 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 148 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 149 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 150 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 151 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 152 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 153 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 154 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 155 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 156 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 157 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 158 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 160, 162, 164, 168, 170, 191, 192, 194, 202, 205, 208, 210, and 213 depending from claim 158 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 159 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 393, 399, 401, and 548 depending from claim 159 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 161 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 423, 424, 425, and 509 depending from claim 161 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 163 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 428, 430, and 507 depending from claim 163 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 165 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 166 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 167 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 169 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 171 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 172, 421, 429, 431, and 437 depending from claim 171 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 173 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 187 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 432, 434, and 445 depending from claim 187 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 188 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 189 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 190 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 443 and 544 depending from claim 190 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 193 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 195 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 426 and 510 depending from claim 195 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 196 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 197 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 402, 404, and 408 depending from claim 197 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 198 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 199 and 200 depending from claim 198 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 201 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 444 and 446 depending from claim 201 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 203 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 435, 436, and 438 depending from claim 203 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 204 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 410, 413, 416, and 447 depending from claim 204 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 206 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 487, 488, and 490 depending from claim 206 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 207 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 209 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 449 and 450 depending from claim 209 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 211 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 212 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 440, 441, and 442 depending from claim 212 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 214 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 215 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 216, 221, and 222 depending from claim 215 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq

and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 217 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 218 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 219 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claim 220 depending from claim 219 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 223 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 225, 234, 459, 460, 461, and 545 depending from claim 223 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 226 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claim 462 depending from claim 226 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 228 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 229 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claim 465 depending from claim 229 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 231 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 232 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 233, 469, 470, 479, and 493 depending from claim 232 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 235 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 236, 237, 471, and 473 depending from claim 235 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 238 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 239, 240, and 475 depending from claim 238 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 241 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 242, 243, 477, and 478 depending from claim 241 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 244 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 245, 246, 247, and 480 depending from claim 244 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 249 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 252 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 255 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 256, 257, and 486 depending from claim 255 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 258 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 259, 260, and 546 depending from claim 258 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 261 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 262, 263, 433, 492, and 494 depending from claim 261 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 264 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 265, 268, 269, and 495 depending from claim 264 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 267 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claim 498 depending from claim 267 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 270 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 271, 272, 496, and 500 depending from claim 270 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 273 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 275, 439, and 503 depending from claim 273 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 274 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 276 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 277 and 506 depending from claim 276 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq

and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 279 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 280, 281, 452, and 508 depending from claim 279 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 301 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 380 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 381 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 382 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 383 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 385 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claim 387 depending from claim 385 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections

5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 388 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claim 476 depending from claim 388 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 390 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 391, 392, and 394 depending from claim 390 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 395 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claim 397 depending from claim 395 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 422 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 427 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 448 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 455 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claim 474 depending from claim 455 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 472 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 485 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claim 484 depending from claim 485 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 511 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claim 512 depending from claim 511 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 513 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claim 514 depending from claim 513 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 515 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claim 516 depending from claim 515 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 517 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claim 518 depending from claim 517 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 519 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claim 520 depending from claim 519 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 521 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claim 522 depending from claim 521 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 523 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claim 524 depending from claim 523 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 525 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claim 526 depending from claim 525 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 527 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claim 528 depending from claim 527 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 529 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claim 530 depending from claim 529 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 531 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claim 532 depending from claim 531 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 533 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 111, 418, 491, 504, and 534 depending from claim 533 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 535 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 453, 456, and 458 depending from claim 535 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 536 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 537 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claim 538 depending from claim 537 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 539 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 481, 482, 483, and 540 depending from claim 539 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 541 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claim 542 depending from claim 541 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 549 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 550 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 551 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 552 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 553 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 554 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 555 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 556 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 557 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 558 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 559 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 560 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 561 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 562 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 563 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 564 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 565 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 566 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 567 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 568 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 569 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 570 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 571 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 572 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 573 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 574 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 575 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 576 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 577 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 578 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 579 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 580 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 581 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 582 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Independent claim 583 finds adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

Dependent claims 543, 544, 545, 546, 547, and 548 find adequate support for enablement in the figures and in the specification, examples of which are set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the enablement rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.3, and 7.5.

7.1.3 Arguments Regarding The 35 USC 102 Anticipation Rejection

Independent claim 187 distinguishes Netravali et al. (4,245,248) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 209 distinguishes Netravali et al. (4,245,248) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 235 distinguishes Netravali et al. (4,245,248) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 279 distinguishes Netravali et al. (4,245,248) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 472 distinguishes Grumet (4,601,053) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 117 distinguishes Meagher (4,694,404) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 148 distinguishes Meagher (4,694,404) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 151 distinguishes Meagher (4,694,404) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 173 distinguishes Meagher (4,694,404) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 217 distinguishes Meagher (4,694,404) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 229 distinguishes Meagher (4,694,404) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 385 distinguishes Meagher (4,694,404) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 231 distinguishes Rogoff et al. (4,590,569) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 388 distinguishes Rogoff et al. (4,590,569) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 527 distinguishes Rogoff et al. (4,590,569) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 137 distinguishes Sacks et al. (4,736,437) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 153 distinguishes Sacks et al. (4,736,437) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 249 distinguishes Sacks et al. (4,736,437) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 579 distinguishes Sacks et al. (4,736,437) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 105 distinguishes Taylor et al. (4,563,703) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 105 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 224, 227, 248, and 400 depending from claim 105 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 106 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 230, 250, 251, and 409 depending from claim 106 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 107 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 451, 463, 464, and 466 depending from claim 107 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 108 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 454 depending from claim 108 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 109 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 110, 112, 389, 497, 543, and 547 depending from claim 109 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 113 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 114 and 403 depending from claim 113 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 115 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 406, 407, and 499 depending from claim 115 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 116 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 117 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 118 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 119 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 120 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 457 depending from claim 120 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 121 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 122 and 396 depending from claim 121 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 123 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 253, 254, and 266 depending from claim 123 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 124 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 467 and 468 depending from claim 124 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 125 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 130, 411, and 501 depending from claim 125 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 126 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 127 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 129, 412, 414, and 502 depending from claim 127 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 128 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 132 and 134 depending from claim 128 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 131 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 133 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 135 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 136 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 138 depending from claim 136 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 137 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 278 and 386 depending from claim 137 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 139 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 140 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 144 depending from claim 140 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 141 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 142 and 405 depending from claim 141 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 143 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 415, 419, 420, and 505 depending from claim 143 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 145 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 146 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 147 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 148 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 149 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 150 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 151 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 152 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 153 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 154 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 155 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 156 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 157 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 158 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 160, 162, 164, 168, 170, 191, 192, 194, 202, 205, 208, 210, and 213 depending from claim 158 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 159 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 393, 399, 401, and 548 depending from claim 159 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 161 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 423, 424, 425, and 509 depending from claim 161 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 163 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 428, 430, and 507 depending from claim 163 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 165 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 166 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 167 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 169 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 171 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 172, 421, 429, 431, and 437 depending from claim 171 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 173 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 187 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 432, 434, and 445 depending from claim 187 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 188 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 189 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 190 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 443 and 544 depending from claim 190 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 193 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 195 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 426 and 510 depending from claim 195 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 -

5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 196 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 197 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 402, 404, and 408 depending from claim 197 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 198 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 199 and 200 depending from claim 198 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 201 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 444 and 446 depending from claim 201 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 203 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 435, 436, and 438 depending from claim 203 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 204 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 410, 413, 416, and 447 depending from claim 204 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 206 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 487, 488, and 490 depending from claim 206 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 207 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 209 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 449 and 450 depending from claim 209 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 211 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 212 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 440, 441, and 442 depending from claim 212 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 214 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 215 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 216, 221, and 222 depending from claim 215 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 217 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 218 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 219 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 220 depending from claim 219 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 223 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 225, 234, 459, 460, 461, and 545 depending from claim 223 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 226 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 462 depending from claim 226 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 228 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 229 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 465 depending from claim 229 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 231 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 232 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 233, 469, 470, 479, and 493 depending from claim 232 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 235 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 236, 237, 471, and 473 depending from claim 235 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 238 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 239, 240, and 475 depending from claim 238 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 241 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 242, 243, 477, and 478 depending from claim 241 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 244 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 245, 246, 247, and 480 depending from claim 244 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 249 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 252 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 255 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 256, 257, and 486 depending from claim 255 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 258 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 259, 260, and 546 depending from claim 258 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 261 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 262, 263, 433, 492, and 494 depending from claim 261 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 264 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 265, 268, 269, and 495 depending from claim 264 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 267 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 498 depending from claim 267 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 270 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 271, 272, 496, and 500 depending from claim 270 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 273 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 275, 439, and 503 depending from claim 273 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 274 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 276 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 277 and 506 depending from claim 276 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 279 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 280, 281, 452, and 508 depending from claim 279 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 301 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 380 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 381 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 382 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 383 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 385 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 387 depending from claim 385 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 388 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 476 depending from claim 388 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 390 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 391, 392, and 394 depending from claim 390 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 -

5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 395 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 397 depending from claim 395 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 422 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 427 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 448 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 455 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 474 depending from claim 455 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 472 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 485 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 484 depending from claim 485 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 511 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 512 depending from claim 511 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 513 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 514 depending from claim 513 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 515 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 516 depending from claim 515 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 517 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 518 depending from claim 517 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 519 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 520 depending from claim 519 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 521 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 522 depending from claim 521 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 523 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 524 depending from claim 523 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 525 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 526 depending from claim 525 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 527 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 528 depending from claim 527 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 529 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 530 depending from claim 529 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 531 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 532 depending from claim 531 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 533 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 111, 418, 491, 504, and 534 depending from claim 533 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 535 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 453, 456, and 458 depending from claim 535 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 536 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 537 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 538 depending from claim 537 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 539 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 481, 482, 483, and 540 depending from claim 539 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 541 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 542 depending from claim 541 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 549 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 550 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupported for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 551 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 552 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 553 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 554 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 555 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 556 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 557 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 558 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 559 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 560 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 561 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 562 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 563 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 564 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 565 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 566 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 567 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 568 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 569 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 570 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 571 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 572 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 573 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 574 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 575 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 576 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 577 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 578 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 579 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 580 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 581 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 582 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 583 distinguishes Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 543, 544, 545, 546, 547, and 548 distinguish Tescher et al. (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 105 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 224, 227, 248, and 400 depending from claim 105 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set

forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 106 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 230, 250, 251, and 409 depending from claim 106 distinguish Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 107 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 451, 463, 464, and 466 depending from claim 107 distinguish Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 108 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 454 depending from claim 108 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications,

vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 109 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 110, 112, 389, 497, 543, and 547 depending from claim 109 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 113 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 114 and 403 depending from claim 113 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 115 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 406, 407, and 499 depending from claim 115 distinguish Jain et al.

("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 116 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 117 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 118 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 119 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 120 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in

Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 457 depending from claim 120 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 121 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 122 and 396 depending from claim 121 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 123 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 253, 254, and 266 depending from claim 123 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 124 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No.

12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 467 and 468 depending from claim 124 distinguish Jain et al.

("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 125 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 130, 411, and 501 depending from claim 125 distinguish Jain et al.

("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 126 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 127 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 129, 412, 414, and 502 depending from claim 127 distinguish Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 128 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 132 and 134 depending from claim 128 distinguish Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 131 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 133 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 135 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in

Sections 5.2 - 5.8. Further, the anticipation rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 136 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 138 depending from claim 136 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 137 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 278 and 386 depending from claim 137 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 139 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 140 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No.

12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 144 depending from claim 140 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 141 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 142 and 405 depending from claim 141 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 143 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 415, 419, 420, and 505 depending from claim 143 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 145 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 146 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 147 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 148 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 149 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 150 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in

Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 151 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 152 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 153 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 154 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 155 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 156 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No.

12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 157 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 158 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 160, 162, 164, 168, 170, 191, 192, 194, 202, 205, 208, 210, and 213 depending from claim 158 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 159 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 393, 399, 401, and 548 depending from claim 159 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 161 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 423, 424, 425, and 509 depending from claim 161 distinguish Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 163 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 428, 430, and 507 depending from claim 163 distinguish Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 165 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 166 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in

Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 167 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 169 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 171 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 172, 421, 429, 431, and 437 depending from claim 171 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 173 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 187 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No.

12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 432, 434, and 445 depending from claim 187 distinguish Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 188 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 189 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 190 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 443 and 544 depending from claim 190 distinguish Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 193 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 195 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 426 and 510 depending from claim 195 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 196 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 197 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 402, 404, and 408 depending from claim 197 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set

forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 198 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 199 and 200 depending from claim 198 distinguish Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 201 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 444 and 446 depending from claim 201 distinguish Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 203 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 435, 436, and 438 depending from claim 203 distinguish Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on

Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 204 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 410, 413, 416, and 447 depending from claim 204 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 206 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 487, 488, and 490 depending from claim 206 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 207 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 209 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 449 and 450 depending from claim 209 distinguish Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 211 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 212 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 440, 441, and 442 depending from claim 212 distinguish Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 214 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in

Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 215 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 216, 221, and 222 depending from claim 215 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 217 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 218 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 219 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 220 depending from claim 219 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications,

vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 223 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 225, 234, 459, 460, 461, and 545 depending from claim 223 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 226 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 462 depending from claim 226 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 228 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 229 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 465 depending from claim 229 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 231 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 232 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 233, 469, 470, 479, and 493 depending from claim 232 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 235 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in

Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 236, 237, 471, and 473 depending from claim 235 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 238 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 239, 240, and 475 depending from claim 238 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 241 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 242, 243, 477, and 478 depending from claim 241 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 244 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No.

12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 245, 246, 247, and 480 depending from claim 244 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 249 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 252 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 255 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 256, 257, and 486 depending from claim 255 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 258 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 259, 260, and 546 depending from claim 258 distinguish Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 261 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 262, 263, 433, 492, and 494 depending from claim 261 distinguish Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 264 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 265, 268, 269, and 495 depending from claim 264 distinguish Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set

forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 267 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 498 depending from claim 267 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 270 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 271, 272, 496, and 500 depending from claim 270 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 273 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 275, 439, and 503 depending from claim 273 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on

Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 274 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 276 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 277 and 506 depending from claim 276 distinguish Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 279 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 280, 281, 452, and 508 depending from claim 279 distinguish Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 301 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 380 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 381 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 382 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 383 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 385 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in

Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 387 depending from claim 385 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 388 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 476 depending from claim 388 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 390 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 391, 392, and 394 depending from claim 390 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 395 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No.

12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 397 depending from claim 395 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 422 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 427 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 448 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 455 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 474 depending from claim 455 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 472 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 485 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 484 depending from claim 485 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 511 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 512 depending from claim 511 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1

et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 513 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 514 depending from claim 513 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 515 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 516 depending from claim 515 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 517 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 518 depending from claim 517 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications,

vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 519 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 520 depending from claim 519 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 521 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 522 depending from claim 521 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 523 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 524 depending from claim 523 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 525 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 526 depending from claim 525 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 527 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 528 depending from claim 527 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 529 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in

Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 530 depending from claim 529 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 531 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 532 depending from claim 531 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 533 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 111, 418, 491, 504, and 534 depending from claim 533 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 535 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No.

12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 453, 456, and 458 depending from claim 535 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 536 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 537 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 538 depending from claim 537 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 539 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 481, 482, 483, and 540 depending from claim 539 distinguish Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 541 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claim 542 depending from claim 541 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 549 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 550 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 551 distinguishes Jain et al. (“Displacement Measurement and Its Application in Interframe Image Coding”, IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in

Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 552 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 553 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 554 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 555 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 556 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 557 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No.

12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 558 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 559 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 560 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 561 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 562 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 563 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 564 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 565 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 566 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 567 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 568 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in

Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 569 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 570 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 571 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 572 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 573 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 574 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No.

12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 575 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 576 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 577 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 578 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 579 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 580 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 581 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 582 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 583 distinguishes Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Dependent claims 543, 544, 545, 546, 547, and 548 distinguish Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 105 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 106 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 107 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 108 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 118 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 119 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 123 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 124 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 126 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 135 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 137 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 143 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 145 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 148 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 153 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 157 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 188 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 189 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 197 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 201 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 203 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 204 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 206 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 212 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 214 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 215 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 218 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 228 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 231 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 249 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 255 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 264 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 267 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 388 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 525 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 527 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 533 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 535 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 539 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 553 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 555 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 557 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 559 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 561 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 564 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 573 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 575 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 578 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

Independent claim 580 distinguishes Fant (4,835,532) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the anticipation rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.7.

7.1.4 Arguments Regarding The 35 USC 103 Obviousness Rejection

Independent claim 244 distinguishes Jain et al., Displacement Measurement and Its Application in Interframe Image Coding, as applied to claims above, and further in view of Tiemann (4,375,650) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Dependent claim 245 depending from claim 244 distinguishes Jain et al., Displacement Measurement and Its Application in Interframe Image Coding, as applied to claims above, and further in view of Tiemann (4,375,650) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Dependent claim 262 depending from claim 261 distinguishes Jain et al., Displacement Measurement and Its Application in Interframe Image Coding, as applied to claims above, and further in view of Tiemann (4,375,650) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 381 distinguishes Jain et al., Displacement Measurement and Its Application in Interframe Image Coding, as applied to claims above, and further in view of Tiemann

(4,375,650) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 143 distinguishes Sacks et al. (4,736,437) and Pincoffs et al. (3,638,188) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 116 distinguishes Fant (4,835,532) and Maguer et al. (3,967,233) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 131 distinguishes Fant (4,835,532) and Maguer et al. (3,967,233) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 149 distinguishes Fant (4,835,532) and Maguer et al. (3,967,233) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 166 distinguishes Fant (4,835,532) and Maguer et al. (3,967,233) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 226 distinguishes Fant (4,835,532) and Maguer et al. (3,967,233) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Dependent claim 462 depending from claim 226 distinguishes Fant (4,835,532) and Maguer et al. (3,967,233) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 301 distinguishes Fant (4,835,532) and Maguer et al. (3,967,233) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 167 distinguishes Fant (4,835,532), Maguer et al. (3,967,233) and Cleminson (4,675,829) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 120 distinguishes Fant (4,835,532) and Tescher (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Dependent claim 457 depending from claim 120 distinguishes Fant (4,835,532) and Tescher (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 207 distinguishes Fant (4,835,532) and Tescher (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 232 distinguishes Fant (4,835,532) and Tescher (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Dependent claims 233, 469, 470, 479, and 493 depending from claim 232 distinguish Fant (4,835,532) and Tescher (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 381 distinguishes Fant (4,835,532) and Tescher (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 571 distinguishes Fant (4,835,532) and Tescher (4,541,012) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 211 distinguishes Fant (4,835,532), Tescher (4,541,012) and Taylor et al. (4,563,703) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 -

5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 556 distinguishes Fant (4,835,532), Tescher (4,541,012) and Mosier (4,583,094) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 572 distinguishes Fant (4,835,532), Tescher (4,541,012) and Mosier (4,583,094) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 567 distinguishes Fant (4,835,532), Tescher (4,541,012) and Sidoti (3,885,325) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 139 distinguishes Fant (4,835,532) and Mosier (4,583,094) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 196 distinguishes Fant (4,835,532) and Mosier (4,583,094) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 252 distinguishes Fant (4,835,532) and Mosier (4,583,094) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 422 distinguishes Fant (4,835,532) and Mosier (4,583,094) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 427 distinguishes Fant (4,835,532) and Mosier (4,583,094) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 558 distinguishes Fant (4,835,532) and Mosier (4,583,094) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 568 distinguishes Fant (4,835,532) and Mosier (4,583,094) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 570 distinguishes Fant (4,835,532) and Mosier (4,583,094) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 574 distinguishes Fant (4,835,532) and Mosier (4,583,094) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 582 distinguishes Fant (4,835,532) and Mosier (4,583,094) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 274 distinguishes Fant (4,835,532), Mosier (4,583,094) and Cleminson (4,675,829) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 552 distinguishes Fant (4,835,532), Mosier (4,583,094) and Cleminson (4,675,829) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 577 distinguishes Fant (4,835,532), Mosier (4,583,094) and Cleminson (4,675,829) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 536 distinguishes Fant (4,835,532), Mosier (4,583,094) and Tabata et al. (4,574,364) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 -

5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 554 distinguishes Fant (4,835,532), Mosier (4,583,094) and Tabata et al. (4,574,364) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 563 distinguishes Fant (4,835,532), Mosier (4,583,094) and Tabata et al. (4,574,364) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 147 distinguishes Fant (4,835,532) and Tabata et al. (4,574,364) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 195 distinguishes Fant (4,835,532), Tabata et al. (4,574,364) and Taylor et al. (4,563,703) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Dependent claims 426 and 510 depending from claim 195 distinguish Fant (4,835,532), Tabata et al. (4,574,364) and Taylor et al. (4,563,703) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 219 distinguishes Fant (4,835,532), Tabata et al. (4,574,364) and Taylor et al. (4,563,703) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Dependent claim 220 depending from claim 219 distinguishes Fant (4,835,532), Tabata et al. (4,574,364) and Taylor et al. (4,563,703) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 583 distinguishes Fant (4,835,532), Tabata et al. (4,574,364) and Sidoti (3,885,325) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 159 distinguishes Fant (4,835,532) and Cleminson (4,675,829) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Dependent claims 393, 399, 401, and 548 depending from claim 159 distinguish Fant (4,835,532) and Cleminson (4,675,829) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 161 distinguishes Fant (4,835,532) and Cleminson (4,675,829) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Dependent claims 423, 424, 425, and 509 depending from claim 161 distinguish Fant (4,835,532) and Cleminson (4,675,829) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 163 distinguishes Fant (4,835,532) and Cleminson (4,675,829) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Dependent claims 428, 430, and 507 depending from claim 163 distinguish Fant (4,835,532) and Cleminson (4,675,829) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 165 distinguishes Fant (4,835,532) and Cleminson (4,675,829) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 193 distinguishes Fant (4,835,532) and Cleminson (4,675,829) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 569 distinguishes Fant (4,835,532), Cleminson (4,675,829) and Sidoti (3,885,325) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 190 distinguishes Fant (4,835,532) and Sidoti (3,885,325) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Dependent claims 443 and 544 depending from claim 190 distinguish Fant (4,835,532) and Sidoti (3,885,325) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 258 distinguishes Fant (4,835,532) and Sidoti (3,885,325) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Dependent claims 259, 260, and 546 depending from claim 258 distinguish Fant (4,835,532) and Sidoti (3,885,325) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 276 distinguishes Fant (4,835,532) and Sidoti (3,885,325) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Dependent claims 277 and 506 depending from claim 276 distinguish Fant (4,835,532) and Sidoti (3,885,325) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 515 distinguishes Fant (4,835,532) and Sidoti (3,885,325) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Dependent claim 516 depending from claim 515 distinguishes Fant (4,835,532) and Sidoti (3,885,325) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 549 distinguishes Fant (4,835,532) and Sidoti (3,885,325) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 550 distinguishes Fant (4,835,532) and Sidoti (3,885,325) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 562 distinguishes Fant (4,835,532) and Sidoti (3,885,325) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 565 distinguishes Fant (4,835,532) and Sidoti (3,885,325) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 581 distinguishes Fant (4,835,532) and Sidoti (3,885,325) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 551 distinguishes Fant (4,835,532), Sidoti (3,885,325) and Lam et al. (4,576,577) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 560 distinguishes Fant (4,835,532), Sidoti (3,885,325) and Lam et al. (4,576,577) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 -

5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 576 distinguishes Fant (4,835,532), Sidoti (3,885,325) and Lam et al. (4,576,577) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 398 distinguishes Fant (4,835,532) and Lam et al. (4,576,577) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Dependent claim 489 depending from claim 398 distinguishes Fant (4,835,532) and Lam et al. (4,576,577) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 133 distinguishes Meagher (4,694,404) and Tucker (4,546,433) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

Independent claim 169 distinguishes Meagher (4,694,404) and Cleminson (4,675,829) with a novel combination of limitations set forth in Tables 5.1 et seq and in Sections 5.2 - 5.8. Further, the obviousness rejection is legally unsupportable for the reasons set forth in Sections 7.2, 7.6, and 7.8.

7.1.5 The Claims Do Not Stand Or Fall Together

The Appellant establishes herein that the claims do not stand or fall together. The claims have differences therebetween and are separately patentable (Section 5). Further, the appealed claims are argued separately (Section 7.1). Hence, the claims do not stand or fall together.

The Federal Circuit requires that all claims which are reasonably argued separately must be treated separately.³⁴

The public responsibility of the Patent and Trademark Office requires attentive performance of all aspects of the patent examination function. The Office is charged with the duty of examining the claims contained in the patent application, including review by the Board when appeal is taken under 35 U.S.C. 134. It is not only unfair to the applicant, it is also inefficient to decline to review claims that are properly appealed and reasonably argued before the Board.

In re Beaver at 1411.

The PTO requires the Examiner to analyze each claim for enablement.³⁵

Accordingly, the first analytic step requires that the Examiner determine exactly what subject matter is encompassed by the claims. The examiner should determine **what each claim recites** and what the subject matter is when the claim is considered as a whole, not when its parts are analyzed individually. **No claim shall be overlooked**

According to the Deputy Assistant Commissioner for Patent Policy and Projects,³⁶ each claim must be separately analyzed for written description:

1. Determine what **each claim as a whole** covers, using well-established principles of claim construction. **Each claim must be separately analyzed** and given its broadest reasonable interpretation in light of and consistent with the written description [underlining added].

In view of the above, the claims are separately argued by the Appellant and the claims do not stand or fall together.

³⁴ See In re Beaver, 893 F.2d 329, 13 USPQ2d 1409 (Fed. Cir. 1989).

³⁵ MPEP 2164.08 (bold emphasis added, underline in original).

³⁶ Stephen G. Kunin, "Written Description Guidelines and Utility Guidelines," Journal of the Patent and Trademark Office Society (JPTOS), Vol. 82, No. 2 at pages 82-83 (February 2000) (emphasis added).

7.2 THE EXAMINER HAS FAILED TO PROVIDE THE REQUIRED “SUBSTANTIAL EVIDENCE” AND HAS FAILED TO ESTABLISH A PRIMA FACIE CASE TO COUNTER THE APPELLANT’S ENTITLEMENT TO A PATENT

The Appellant is “entitled” to a patent (Section 7.2.1). The Examiner is required to provide “substantial evidence” (Section 7.2.2) and to establish a prima facie case (Section 7.2.1) in order to challenge the Appellant’s entitlement thereto. However, the Examiner has neither provided the required “substantial evidence” nor established a prima facie case. Instead, the Examiner makes unsupported conclusory statements and misrepresents the prior art and the disclosure. This is expressly discouraged by the Federal Circuit (Section 7.2.3) and does not satisfy the requirement for providing “substantial evidence”. Furthermore, the Appellant provided extensive evidence, but the Examiner disregarded or misrepresented the Appellant’s evidence in further disregard for the law of the Federal Circuit (Section 7.2.4).

7.2.1 The Appellant Is Entitled To A Patent

The Appellant is entitled to a patent because he has met the legal requirements. The Examiner has not established a prima facie case and has not provided the required “substantial evidence” (see this Section 7.2.1 and see Section 7.2.2) to challenge this entitlement.

Judge Plager, in his concurring opinion in Oetiker³⁷, stated:

An applicant for a patent is entitled to the patent unless the application fails to meet the requirements established by law. It is the Commissioner’s duty (acting through the examining officials) to determine that all requirements of the Patent Act are met. The burden is on the Commissioner to establish that the applicant is not entitled under the law to a patent. In re Warner, 379 F.2d 1011, 1016, 154 USPQ 173, 177 (CCPA 1967), cert. denied, 389 U.S. 1057 (1968). In rejecting an application, factual determinations by the PTO must be based on a preponderance of the evidence, and legal conclusions must be correct. In re Caveney, 761 F.2d 671, 674, 226 USPQ 1, 3 (Fed. Cir. 1985).

The process of patent examination is an interactive one. See generally, Chisum, Patents, § 11.03 et seq. (1992). The examiner

³⁷ In re Oetiker, 977 F.2d 1443, 1449, 24 USPQ2d 1443, 1447 (Fed. Cir. 1992) (emphasis added).

cannot sit mum, leaving the applicant to shoot arrows into the dark hoping to somehow hit a secret objection harbored by the examiner. The ‘prima facie case’ notion, the exact origin of which appears obscure (see *In re Piasecki*, 745 F.2d 1468, 1472, 233 USPQ 785, 788 (Fed. Cir. 1984)), seemingly was intended to leave no doubt among examiners that they must state clearly and specifically any objections (the prima facie case) to patentability, and give the applicant fair opportunity to meet those objections with evidence and argument. To that extent the concept serves to level the playing field and reduces the likelihood of administrative arbitrariness.

* * *

Specifically, when obviousness is at issue, the examiner has the burden of persuasion and therefore the initial burden of production. Satisfying the burden of production, and thus initially the burden of persuasion, constitutes the so-called prima facie showing. Once that burden is met, the applicant has the burden of production to demonstrate that the examiner’s preliminary determination is not correct. The examiner, and if later involved, the Board, retain the ultimate burden of persuasion on the issue.

If, as a matter of law, the issue is in equipoise, the applicant is **entitled** to the patent. Thus on appeal to this court as in the PTO, the applicant does not bear the ultimate burden of persuasion on the issue. In the end there is no reason there or here to argue over whether a ‘prima facie’ case was made out. The only determinative issue is whether the record as a whole supports the legal conclusion that the invention would have been obvious.

The Examiner failed to establish a prima facie case for the rejections. For example, the Examiner did not properly consider the disclosure as a whole, nor the many occurrences of the claim limitations in the disclosure, nor the disclosed actually reduced-to-practice “experimental system” embodiment. Further, the Examiner did not establish lack of written description nor lack of enablement in view of the disclosed actually reduced-to-practice “experimental system” embodiment. Further, the Examiner did not perform the required Graham³⁸, Gechter³⁹, or Rouffet⁴⁰ analyses and did not consider

³⁸ Graham v. John Deere Co., 383 U.S. 1, 148 USPQ 459 (1966).

³⁹ Gechter v. Davidson, 116 F.3d 1454, 43 USPQ2d 1030 (Fed. Cir. 1997).

⁴⁰ In Re Rouffet, 149 F.3d 1350, 47 USPQ2d 1453, 1457-58 (Fed. Cir. 1998) (emphasis added).

the claims as a whole. For these reasons and the other reasons of record, the Examiner did not establish a prima facie case.

7.2.2 The U.S. Supreme Court And The Federal Circuit Require “Substantial Evidence” To Support A Rejection

The Federal Circuit requires “substantial evidence” to support a rejection. See Gartside and Kotzab.⁴¹

The reviewing court shall –

* * *

(2) hold unlawful and set aside agency actions, findings, and conclusions found to be --

* * *

(E) unsupported by substantial evidence

Gartside.⁴²

Thus, the plain language of §§ 7 and 144 of title 35 indicates ... that we should therefore review Board factfinding for “substantial evidence.”

Gartside.⁴³

[W]e review the Board’s underlying factual findings for substantial evidence

Kotzab.⁴⁴

However, in this case, the rejections are not supported by “substantial evidence”, but rather are largely supported by erroneous arguments and improper conclusory statements. Hence, the rejections cannot stand.

“Substantial evidence” is described by the Federal Circuit in Gartside as follows:⁴⁵

⁴¹ In re Gartside, 203 F.3d 1305, 53 USPQ2d 1769 (Fed. Cir. 2000); In re Kotzab, 217 F.3d 1365, 55 USPQ2d 1313 (Fed. Cir. 2000).

⁴² In re Gartside, 203 F.3d 1305, 53 USPQ2d 1769, 1773 (Fed. Cir. 2000).

⁴³ In re Gartside, 203 F.3d 1305, 53 USPQ2d 1769, 1774 (Fed. Cir. 2000).

⁴⁴ In re Kotzab, 217 F.3d 1365, 55 USPQ2d 1313, 1316-17 (Fed. Cir. 2000).

⁴⁵ In re Gartside, 203 F.3d 1305, 53 USPQ2d 1769, 1773 (Fed. Cir. 2000) (citing Consolidated Edison Co. v. NLRB, 305 U.S. 197, 229 (1938)).

[T]he “substantial evidence” standard asks whether a reasonable fact finder could have arrived at the agency’s decision.

The Gartside court quotes the U.S. Supreme Court in Consolidated⁴⁶:

It [“substantial evidence”] means such relevant evidence as a reasonable mind might accept as adequate to support a conclusion Mere uncorroborated hearsay or rumor does not constitute substantial evidence.

However, the instant rejections are not supported by “substantial evidence”. Instead, the Examiner improperly relies on conclusory statements and erroneous statements (Section 7.2.3). Hence, the rejections violate the law of the Federal Circuit and the law of the U.S. Supreme Court.

7.2.3 The Examiner Relies On Conclusory Statements, Which Are Discouraged By The U.S. Supreme Court And By The Federal Circuit

The Examiner relies on conclusory statements, which are expressly discouraged by the U.S. Supreme Court and by the Federal Circuit. The Gartside court quotes the U.S. Supreme Court in Consolidated⁴⁷:

It [“substantial evidence”] means such relevant evidence as a reasonable mind might accept as adequate to support a conclusion Mere uncorroborated hearsay or rumor does not constitute substantial evidence.

This is confirmed in Kotzab.⁴⁸

Whether the Board relies on an express or an implicit showing, it must provide particular findings related thereto Broad conclusory statements standing alone are not “evidence.”

⁴⁶ In re Gartside, 203 F.3d 1305, 53 USPQ2d 1769, 1773 (Fed. Cir. 2000) (quoting Consolidated Edison Co. v. NLRB, 305 U.S. 197, 229-30 (1938)) (parenthetical added, ellipsis in original).

⁴⁷ In re Gartside, 203 F.3d 1305, 53 USPQ2d 1769, 1773 (Fed. Cir. 2000) (quoting Consolidated Edison Co. v. NLRB, 305 U.S. 197, 229-30 (1938)) (parenthetical added, ellipsis in original).

⁴⁸ In re Kotzab, 217 F.3d 1365, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000).

However, the present rejections are not supported by “substantial evidence”. Instead, the Examiner relies on conclusory statements and erroneous statements without “substantial evidence” sufficient to support his legal conclusions.

The Appellant provided extensive evidence (even though it is not the Appellant’s burden to do so) yet the Examiner has not provided the required “substantial evidence” either to support the rejections or to address the Appellant’s extensive evidence. For example, regarding the § 112-1 rejections, the instant disclosure is in itself extensive evidence that must be presumed to be correct (Section 7.3.3). See also, e.g., Zodiac.⁴⁹ The Federal Circuit requires the PTO to “explicate its factual conclusions” and “provide particular findings”, which the Examiner has failed to do:

We have expressly held that the Board’s opinion must explicate its factual conclusions, enabling us to verify readily whether those conclusions are indeed supported by “substantial evidence” contained within the record. See Gechter v. Davidson, 116 F.3d 1454, 1460, 43 USPQ2d 1030, 1035 (Fed. Cir. 1997)

Gartside.⁵⁰

Whether the Board relies on an express or an implicit showing, it must provide particular findings related thereto Broad conclusory statements standing alone are not “evidence.”

Kotzab.⁵¹

Judge Barrett in Hyatt `355⁵² stated:

Our reviewing court, the U.S. Court of Appeals for the Federal Circuit, has no way of verifying those facts from the record; **our assertions are not evidence**.

Hence, if the Board’s assertions are not evidence, the Examiner’s conclusory statements are certainly not evidence and hence fail to establish a prima facie case.

⁴⁹ Zodiac Pool Care, Inc. v. Hoffinger Indus., 206 F.3d 1408, 1414, 54 USPQ2d 1141, 1145 (Fed. Cir. 2000).

⁵⁰ In re Gartside, 203 F.3d 1305, 53 USPQ2d 1769, 1774 (Fed. Cir. 2000).

⁵¹ In re Kotzab, 217 F.3d 1365, 55 USPQ2d 1313 (Fed. Cir. 2000).

⁵² Ex parte Hyatt, Appeal No. 1994-3042, Paper No. 39 at 36 in patent application Serial No. 07/289,355 (PTO Bd. App. December 21, 2000) [herein Hyatt-`355] (unpublished PTO decision) (emphasis added).

7.2.4 The Appellant Provided Extensive Evidence, But The Examiner Violated The Law Of The U.S. Supreme Court And The Federal Circuit And Did Not Properly Consider The Appellant's Evidence

The “substantial evidence” review requires examination of the record as a whole, taking into account evidence that detracts from the agency’s decision.

The [U.S. Supreme] Court has emphasized that “substantial evidence” review involves examination of the record as a whole, taking into account evidence that both justifies and detracts from an agency’s decision. See Universal Camera Corp. v. NLRB, 340 U.S. 474, 487-88 (1951).

Gartside.⁵³ However, the Examiner violated the law of the U.S. Supreme Court and the Federal Circuit and ignored or misrepresented the substance of the Appellant’s evidence.

It is well established that the application disclosure is intrinsic evidence (see, e.g., Zodiac),⁵⁴ and the instant disclosure has significant descriptions, both in the verbal description and in the figures (Section 5). This is significant evidence regarding § 112-1 that has not been properly addressed and that has been misrepresented by the Examiner.

The rejections are, in effect, based on conclusory and erroneous statements and ignore or misrepresent the extensive evidence provided by the Appellant. Such rejections are in clear violation of the law of the U.S. Supreme Court and the Federal Circuit and should be reversed.

7.2.5 Finding Isolated Bits-And-Pieces In The Prior Art Does Not Constitute Evidence, Much Less The “Substantial Evidence” Required To Support An Obviousness Rejection

The Federal Circuit established that finding isolated bits-and-pieces in the prior art does not constitute evidence, much less the “substantial evidence” required to support an obviousness rejection.

⁵³ In re Gartside, 203 F.3d 1305, 53 USPQ2d 1769, 1773 (Fed. Cir. 2000).

⁵⁴ Zodiac Pool Care, Inc. v. Hoffinger Indus., 206 F.3d 1408, 1414, 54 USPQ2d 1141, 1145 (Fed. Cir. 2000).

The Federal Circuit in Kotzab⁵⁵ reiterated the requirement for “motivation, suggestion or teaching” of the combination to support the combining of prior art elements in a § 103 rejection:

Most if not all inventions arise from a combination of old elements Thus, every element of a claimed invention may often be found in the prior art However, identification in the prior art of each individual part claimed is insufficient to defeat patentability of the whole claimed invention Rather, to establish obviousness based on a combination of the elements disclosed in the prior art, there must be some motivation, suggestion or teaching of the desirability of making the specific combination that was made by the applicant Even when obviousness is based on a single prior art reference, there must be a showing of [sic or] a suggestion or motivation to modify the teachings of that reference.

However, in direct violation of the above, the current obviousness rejections are erroneously based upon the Examiner finding bits-and-pieces of the claims in the references and then alleging obviousness. This is the epitome of improper conclusory statements. Nevertheless, isolated bits-and-pieces without a showing of “motivation, suggestion or teaching” does not establish obviousness. Hence, the obviousness rejections do not provide the required “substantial evidence”. Thus, the § 103 obviousness rejections should be reversed.

The Federal Circuit explained about “the hindsight trap” in reversing an obviousness rejection in Kotzab.⁵⁶

In this case, the Examiner and the Board fell into the hindsight trap. The idea of a single sensor ... is a technologically simple concept. With this simple concept in mind, the Patent and Trademark Office found prior art statements that ... appeared to suggest the claimed limitation. But, there was no finding as to the specific understanding or principle within the knowledge of a skilled artisan that would have motivated one with no knowledge of Kotzab’s invention to make the combination in the manner claimed. In light of our holding of the absence of a motivation to combine the teachings in Evans, we conclude that the Board did not make out a proper prima facie case of obviousness

⁵⁵ In re Kotzab, 217 F.3d 1365, 55 USPQ2d 1313, 1316-17 (Fed. Cir. 2000).

⁵⁶ In re Kotzab, 217 F.3d 1365, 55 USPQ2d 1313, 1318 (Fed. Cir. 2000) (emphasis added).

Similarly, in the instant application, by failing to properly establish “some motivation, suggestion or teaching” in the prior art to make the claimed combination, the Examiner failed to establish a prima facie case of obviousness and hence the Examiner “fell into the hindsight trap” (Section 7.8.4). Thus, the instant § 103 obviousness rejections should be reversed.

7.2.6 The Failure To Properly Construe The Rejected Claims Is Fatal To The Rejections

The Examiner did not properly construe the rejected claims, which is fatal to all of the rejections. See Gechter.⁵⁷ See also Sections 7.3.5.1 and 7.6.4. The Examiner must construe each rejected claim”, he must construe “each contested limitation”, and he must construe each claim as a whole, where “[c]laim construction is an essential part of the examination process”. Attempting to construe unclaimed subject matter (Section 7.4.1) is wrong and obscures and confuses the rejections. Attempting to construe bits-and-pieces of the claims is no substitute for the required construction of each rejected claim as a whole (see below and Section 7.6.4).

1. For Each Claim, Determine What the Claim as a Whole Covers

Claim construction is an essential part of the examination process. **Each claim** must be separately analyzed and given its broadest reasonable interpretation in light of and consistent with the written description. The entire claim must be considered, including the preamble language and the transitional phrase.

PTO written description Guidelines.⁵⁸

Implicit in our review of the Board’s anticipation analysis is that **the claim must first have been correctly construed** to define the scope and meaning of **each contested limitation**.

Gechter at 1032 (emphasis added).

[I]f the claims were misconstrued, a finding of anticipation must be reversed unless the error was harmless.

⁵⁷ Gechter v. Davidson, 116 F.3d 1454, 43 USPQ2d 1030 (Fed. Cir. 1997),

⁵⁸ Guidelines for the Examination of Patent Applications Under the 35 U.S.C. 112, ¶ 1, “Written Description” Requirement, Section II.A.1, 1242 Official Gazette 173 (January 30, 2001) (emphasis added).

Gechter at 1033.

Accordingly, the first analytic step requires that **the Examiner determine exactly what subject matter is encompassed by the claims**. The examiner should determine what **each claim** recites and what the subject matter is when the claim is considered as a whole, not when its parts are analyzed individually. **No claim shall be overlooked**.

MPEP 2164.08 (bold emphasis added, underline in original).

Before any analysis of enablement can occur, it is necessary for the examiner to construe the claims. For terms that are not well-known in the art, or for terms that could have more than one meaning, it is necessary that the examiner select the definition that he/she intends to use when examining the application, based on his/her understanding of what applicant intends it to mean, and explicitly set forth the meaning of the term and the scope of the claim when writing an Office action. See Genentech v. Wellcome Foundation, 29 F.3d 1555, 1563-64, 31 USPQ2d 1161, 1167-68 (Fed. Cir. 1994).

MPEP 2164.04.

Thus, if the Examiner had properly construed the rejected claims in view of the prior art and in view of the disclosure, as he is required to do,⁵⁹ he would have realized that the claims meet § 112-1 and distinguish the prior art references.

MPEP § 2163 states that, for each claim, the examiner must determine what the claim as a whole covers. The MPEP goes on to state that claim construction is an essential part of the examination process. Further, each claim must be separately analyzed and given its broadest reasonable interpretation in light of and consistent with the written description.

MPEP § 2163 cites to In re Morris, 127 F.3d 1048, 44 USPQ2d 1023 (Fed. Cir. 1997) to support the requirement to give claims their broadest reasonable interpretation. The court, in Gechter⁶⁰ commented, in focusing upon an anticipation rejection:

Implicit in our review of the Board's anticipation analysis is that the claim must first have been correctly construed to define the scope and meaning of each contested limitation. See, e.g., In re Paulsen, 30 F.3d

⁵⁹ Phillips v. AWH Corp., 415 F.3d 1303, 75 USPQ2d 1321, 1329-30 (Fed. Cir. July 12, 2005) (*en banc*).

⁶⁰ Gechter v. Davidson, 116 F.3d 1454, 43 USPQ2d 1030, 1032 (Fed. Cir. 1997).

1475, 1479, 31 USPQ2d 1671, 1674 (Fed. Cir. 1994) (“[T]o properly compare [an allegedly anticipatory prior art reference] with the claims at issue, we must construe the term ‘computer’ to ascertain its scope and meaning.”). Claim construction is a question of law and therefore reviewed de novo.

In Medichem, S.A. v. Rolabo S.L., 353 F.3d 928, 69 USPQ2d 1283, 1286 (Fed. Cir. 2003) (citations omitted), the court addressed the standards of review employed in anticipation and obviousness inquiries:

Both anticipation under § 102 and obviousness under § 103 are two-step inquiries. The first step in both analyses is a proper construction of the claims, which we review de novo. The second step in the analyses requires a comparison of the properly construed claim to the prior art.

It is black letter law that the claims must be properly construed in view of the disclosure and in view of the prior art. See Sections 7.3.5.1, 7.2.6, and 7.6.4. Without a proper claim construction, the rejections must fall. The Federal Circuit's recent en banc decision in Phillips establishes that **the PTO must consider both intrinsic evidence and extrinsic evidence** for claim construction.⁶¹

Although we have emphasized the importance of intrinsic evidence in claim construction, we have also authorized district courts to rely on extrinsic evidence, which "consists of all evidence external to the patent and prosecution history, including expert and inventor testimony, dictionaries, and learned treatises." Markman, 52 F.3d at 980, citing Seymour v. Osborne, 78 U.S. (11 Wall.) 516, 546 (1870); see also Vitronics, 90 F.3d at 1583. However, while extrinsic evidence "can shed useful light on the relevant art," we have explained that it is "less significant than the intrinsic record in determining 'the legally operative meaning of claim language.'" C.R. Bard, Inc. v. U.S. Surgical Corp., 388 F.3d 858, 862 [73 USPQ2d 1011] (Fed. Cir. 2004), quoting Vanderlande Indus. Nederland BV v. Int'l Trade Comm'n, 366 F.3d 1311, 1318 [70 USPQ2d 1696] (Fed. Cir. 2004); see also Astrazeneca AB v. Mutual Pharm. Co., 384 F.3d 1333, 1337 [72 USPQ2d 1726] (Fed. Cir. 2004).

However, the Examiner failed to properly consider the evidence regarding claim construction and the Examiner failed to properly construe the claims as a whole.

⁶¹ Phillips v. AWH Corp., 415 F.3d 1303, 75 USPQ2d 1321, 1329-30 (Fed. Cir. July 12, 2005) (en banc).

The Examiner failed to properly consider the intrinsic evidence (e.g., the disclosure) (Section 7.2.6) and the Examiner failed to properly consider the extrinsic evidence (e.g., the prior art). Even if the Examiner had adequately construed the claims (which he did not do) the Examiner must also look to the extrinsic evidence (e.g., the prior art) to construe the claims, which he did not adequately do.

In view of the above, the rejections are improper and should be reversed because the Examiner failed to properly construe the rejected claims.

7.3 ARGUMENTS COMMON TO § 112-1 ENABLEMENT AND WRITTEN DESCRIPTION REJECTIONS

7.3.1 Introduction

The Appellant traverses the § 112-1 written description rejection for the reasons discussed in this Section 7.3 and in Section 7.4 and the Appellant traverses the § 112-1 enablement rejection for the reasons discussed in this Section 7.3 and in Section 7.5.

The claims all recite combinations of limitations that are different from the combinations of limitations of the other claims (Section 5.1) and hence are separately patentable. Each of these limitations is relevant to separate patentability and these limitations distinguish the instant claims therebetween. The separate arguments for separate patentability of each claim are provided in Sections 5.1 and 7.1. Thus, the claims do not stand or fall together.

MPEP 706.03⁶² establishes that the instant application should not have “undue emphasis” given to “technical” issues (e.g., disclosure issues). Any effort to rely on technical rejections should be minimized or eliminated unless such rejections are critical. Hence, the § 112-1 “technical” (disclosure) rejections are improper in view of the extensive and detailed instant disclosure. MPEP 706.03 further requires that such § 112-1 (disclosure) rejections “should be stated with a full development of the reasons rather than by a mere conclusion coupled with some stereotyped expression.” In violation thereof, the § 112-1 rejections are based upon erroneous, unsupported, and conclusory statements.

⁶² **‘706.03 Rejections Not Based on Prior Art**

The primary objective of the examination of an application is to determine whether or not the claims define a patentable advance over the prior art. This consideration should not be relegated to a secondary position while undue emphasis is given to nonprior art or “technical” rejections. Effort in examining should be concentrated on truly essential matters, minimizing or eliminating effort on technical rejections which are not really critical. Where a major technical rejection is proper (e.g., lack of proper **disclosure** ...) such rejection should be stated with a full development of the reasons rather than by a mere conclusion coupled with some stereotyped expression.’ (emphasis added).

7.3.2 The Failure Of The Examiner To Properly Consider The Disclosed Actually Reduced-To-Practice “Experimental System” Is Fatal To The § 112-1 Rejections

The Examiner has apparently disregarded the disclosed actually reduced-to-practice “experimental system”. See Section 5.7. See also Sections 7.3.10, 7.3.16, 7.5.8, and 7.5.10. The Examiner states (e.g.; prior Action at 54):

The specification never once describes the integration of the individual disclosed elements to perform the overall claimed functions. That is, the specification never once describes any interconnections or interrelations between the individual functional elements, including any timing between them, any control between them, or any input-output characteristics between them in such a manner that would enable one skilled in the art to make and use the later claimed inventions without undue or unreasonable experimentation.

For this reason alone, the § 112-1 rejections cannot stand.

Regarding the features that were not actually reduced-to-practice in the “experimental system”, the “experimental system” provides a development embodiment for for actually reducing-to-practice and demonstrating these features. For example, a computer, display, operator interface, and operating system are provided in the “experimental system” for implementing additional features. This too should have been recognized by the Examiner but was not.

7.3.3 The Instant Disclosure Is Legally Correct And Presumptively Valid According To The CCPA, The Federal Circuit, And The PTO

MPEP 2164.04 states that an applicant’s disclosure is legally correct and **presumptively valid** and that an examiner must provide sufficient objective reasons to challenge this presumption. However, in the instant application, the Examiner has not provided the required objective reasons to overcome the presumption. In fact, the Examiner has not properly reconciled the § 112-1 rejections with this presumption. This is not surprising since the instant disclosure is extensive and certainly sufficient (e.g.; Section 5). Hence, the § 112-1 rejections should be reversed.

Court decisions confirm that a disclosure such as the instant disclosure is legally correct and presumptively accurate and that the Examiner is required to provide acceptable evidence or reasoning (e.g., “substantial evidence” (Section 7.2.2)) regarding any challenge to the disclosure:

As a matter of Patent Office practice then, a specification disclosure which contains a teaching of the manner and process of making and using the invention in terms which correspond in scope to those used in describing and defining the subject matter sought to be patented must be taken as in compliance with the enabling requirement of the first paragraph of Section 112 **unless there is reason to doubt the objective truth of the statements contained therein** which must be relied on for enabling support....

In any event, it is incumbent upon the Patent Office, whenever a rejection on this basis is made, to explain why it doubts the truth or accuracy of any statement in a supporting disclosure and to back up assertions of its own **with acceptable evidence or reasoning which is inconsistent with the contested statement**. Otherwise, there would be no need for the applicant to go to the trouble and expense of supporting his presumptively accurate disclosure.

Marzocchi.⁶³

There is no requirement in 35 USC 112 or anywhere else in the patent law that a specification convince persons skilled in the art that the assertions in the specification are correct.

In examining a patent application, **the PTO is required to assume that the specification complies with the enablement provision of Section 112 unless it has ‘acceptable evidence or reasoning’ to suggest otherwise**.... The PTO thus must provide reasons supported by the record as a whole why the specification is not enabling.... Then and only then does the burden shift to the applicant to show that one of ordinary skill in the art could have practiced the claimed invention without undue experimentation.

Gould.⁶⁴

⁶³ In re Marzocchi, 439 F.2d 220, 223-24, 169 USPQ 367, 369-70 (CCPA 1967). (emphasis added).

⁶⁴ Gould v. Mossinghoff, 229 USPQ 1, 13-14 (D.D.C. 1985), *aff’d in part, vacated in part, and remanded sub nom.* See also Gould v. Quigg, 822 F.2d 1074, 3 USPQ2d 1302 (Fed. Cir. 1987) (emphasis added).

However, the Examiner has not identified the necessary “contested statement” nor has he provided “acceptable evidence or reasoning” or “substantial evidence” to overcome this legal presumption. This is not surprising since the instant disclosure satisfies § 112-1.

Furthermore, the CCPA and the Federal Circuit citing to In re Fisher “respecting enablement” reiterated “the high level of predictability in mechanical or electrical environments”. See also Hormone, Bowen, Hogan, and Fisher (Section 7.5.8.3).⁶⁵

In view of the above, in addition to the extensive support in the disclosure regarding the claims, the disclosure is legally correct and presumptively valid. Hence, the § 112-1 rejections should be reversed.

7.3.4 The Decision On Summary Judgment In Hyatt v. Dudas Is Relevant To The Instant Appeal

A District Court decision on summary judgment in Hyatt v. Dudas⁶⁶ is relevant to the instant appeal. This decision is attached hereto in Section 9.5.

The instant written description rejection is based in significant part on the requirement for a “self contained embodiment” and a “coherent embodiment”. However, these are improper bases for a § 112-1 rejection infra. Thus, the § 112-1 written description rejection fails to establish a prima facie case and should be reversed.

As set forth in Hyatt v. Dudas,⁶⁷ in the instant application “the PTO at times used rather vague and unspecific language”:

In this case, the PTO apparently required Hyatt to include a “self-contained embodiment describing each and every limitation of the claim”

⁶⁵ Hormone Research Foundation Inc. v. Genentech Inc., 904 F.2d 1558, 15 USPQ2d 1039, 1048 (Fed. Cir. 1990) (quoting In re Hogan, 559 F.2d 595, 194 USPQ 527, 537-538 (CCPA 1977)) (discussing In re Fisher, 427 F.2d 833, 166 USPQ 18, 24 (CCPA 1970)).

⁶⁶ Hyatt v. Dudas, 1:03-cv-00108 (EGS), MEMORANDUM OPINION (Document 75) (D.D.C. October 13, 2005).

⁶⁷ See Hyatt v. Dudas, 1:03-cv-00108 (EGS), MEMORANDUM OPINION (Document 75) at p. 19 (D.D.C. October 13, 2005).

in his disclosures. *See* 108-F-2,700. It is difficult on this record to determine what the PTO meant by a “self-contained embodiment,” or whether this requirement is consistent with the case law, because the phrase is not defined nor does it appear in any of the cases. Moreover, in rejecting plaintiff's applications, the PTO at times used rather vague and unspecific language.

Thus, for this reason alone, the written description rejection should be reversed for failure to establish a prima facie case. This despite the fact that the instant disclosure provides the epitome of a “self-contained embodiment” (Section 5.6).

7.3.5 The Instant § 112-1 Rejections Are Improperly Based Upon Unclaimed Subject Matter

7.3.5.1 The Law On Unclaimed Subject Matter Is Fatal To The § 112-1 Rejections

Title 35 clearly establishes the right of an inventor to a patent subject to the conditions and requirements of Title 35:

35 U.S.C. 101 Inventions patentable.

Whoever invents or discovers ... may obtain a patent therefore, subject to the conditions and requirements of this title.

This is an express prohibition of non-statutory requirements that deprive an inventor of this right to a patent. Hence, such non-statutory bases for the § 112-1 rejections are prohibited by law.

The prohibition against non-statutory requirements was reinforced by the Supreme Court in the recent Pfaff decision⁶⁸ which criticized the Federal Circuit for a non-statutory “substantially completed” rule which “finds no support in the text of the statute.”⁶⁹

The Federal Circuit established that unclaimed subject matter is not subject to the disclosure requirements of § 112-1:⁷⁰

⁶⁸ Pfaff v. Wells Electronics, Inc., 525 U.S. 55, 119 S.Ct. 304, 48 USPQ2d 1641 (1998).

⁶⁹ Id. at 311, 48 USPQ2d at 1646.

⁷⁰ Engel Indus., Inc. v. Lockformer Co., 946 F.2d 1528, 20 USPQ2d 1300, 1302 (Fed. Cir. 1991).

Unclaimed subject matter is not subject to the disclosure requirements of § 112; the reasons are pragmatic: the disclosure would be boundless, and the pitfalls endless.

The Federal Circuit confirms that the analysis should be focused on the "claimed circuitry", not the "unclaimed circuitry". See DeGeorge, discussed above.

A § 112-1 rejection that is based upon **unclaimed** subject matter should be reversed:

OPINION * * *

Nor will we sustain the rejection of selected claims 1, 4, 5, 7, 11 through 13, 16, 24 and 29 under 35 U.S.C. 112 as being based upon an insufficient disclosure And second, we agree with the appellant that the examiner's criticisms of the disclosure of the present application at pages 2-5 of the answer are irrelevant because they do not pertain to claimed subject matter. Cf. In re Brown, 477 F.2d 946, 177 USPQ 691 (CCPA 1973); In re Ghiron, 442 F.2d 985, 169 USPQ 723 (CCPA 1971). * * *

Accordingly, all grounds of rejection advanced by the examiner are reversed.

Hyatt-'277⁷¹. See also Uniroyal.⁷² Hence, rejections under § 112-1 must be evaluated based upon **the claimed invention. Matter that is not claimed is not relevant to a § 112-1 rejection.** Written description must exist for the invention as claimed and not for some other unclaimed subject matter.⁷³ Since the instant § 112-1 rejections are improperly based upon subject matter that is **not claimed**, the § 112-1 rejections for claims that do not recite the allegedly objectionable unclaimed subject matter should be reversed.

Further, the Federal Circuit established that it is the claimed invention which requires support. See Wright.⁷⁴ Disclosure of unclaimed subject matter is irrelevant to a § 112-1 rejection and the

⁷¹ Ex Parte Hyatt, Appeal No. 88-0854, Paper No. 24 at 3-5 in patent application Serial No. 06/520,277 which issued as U.S. Patent No. 4,910,706 on March 20, 1990 (PTO Bd. App. April 14, 1989) [herein Hyatt-'277] (unpublished PTO decision) (footnote omitted).

⁷² Uniroyal, Inc. v. Rudkin-Wiley Corp., 837 F.2d 1044, 5 USPQ2d 1434 (Fed. Cir. 1998), cert. denied, 488 U.S. 825 (1988).

⁷³ In re Wright, 999 F.2d 1557, 27 USPQ2d 1510 (Fed. Cir. 1993); Christianson v. Colt Indus. Corp., 822 F.2d 1544, 3 USPQ2d 1241 (Fed. Cir. 1987), vacated on jurisdictional grounds and remanded, 486 U.S. 800, 7 USPQ2d 1109 (1988).

⁷⁴ In re Wright, 999 F.2d 1557, 27 USPQ2d 1510, 1513 (Fed. Cir. 1993).

Examiner's arguments related thereto are irrelevant and do not provide the required "substantial evidence" (Section 7.2.2). See Gartside, Kotzab, and Zurko⁷⁵. It is not surprising that the Examiner is preoccupied with irrelevant and conclusory arguments because the instant disclosure more than satisfies § 112-1.

The § 112-1 rejections are improperly based upon unclaimed subject matter which is a non-statutory grounds and hence is prohibited by law. For example, the § 112-1 rejections are effectively rejections of the disclosure rather than the claims and thus constitute unclaimed subject matter (discussed below). Further, the § 112-1 rejections are based upon a so-called "example claim", but this single claim is not representative of the other claims and thus constitutes unclaimed subject matter (Section 7.3.5.2). Further, the § 112-1 rejections are based upon mechanical type disclosure requirements, but this is not appropriate for a digital image processing system and certainly not for a software implemented system (Section 7.3.5.3).

The § 112-1 rejections complain about the alleged deficiencies of the disclosure without properly relating these alleged disclosure deficiencies to the subject matter of the various claims. For example, the Examiner makes an attempt to construe the claims (instant Action at 30-36); however, despite the significant deficiency of the attempted claim construction (Sections 7.3.5.1, 7.2.6, and 7.6.4), some of the terms are not even recited in the claims, which constitutes unclaimed subject matter, and those terms that are recited in the claims are addressed as bits and pieces, they are not addressed as a whole as required (Section 7.3.7).

Further, the § 112-1 rejections object to "can be" and "may be" type terminology in the disclosure but do not relate this objection to the claims. See instant Action at 10 and 18; prior Action at 23 and 57; and see Section 7.3.12.6 herein.

See prior Action at 23 and 57 (emphasis added):

Numerous recitations of how the architecture "can be" configured appear throughout the specification (e.g., refer to pages, 133, 148, 156, 185, etc.).

⁷⁵ In re Gartside, 203 F.3d 1305, 53 USPQ2d 1769 (Fed. Cir. 2000); In re Kotzab, 217 F.3d 1365, 55 USPQ2d 1313 (Fed. Cir. 2000); and In re Zurko, 258 F.3d 1379, 59 USPQ2d 1693 (Fed. Cir. 2001).

In summary, the disclosed invention appears to be an image processing system, having specific "architecture" comprised of "modules" that can be "implemented" by "configuring" the modules using "software".

What is most telling about the disclosed invention, especially with regard to the 35 USC 112, first paragraph enablement requirement, is what is NOT disclosed

For example, the specification is replete with the use of terms like "can be", "may be used", "could be used", "such as", "for example", etc. (see the above quoted sections of the specification from pages 454, 466, and 494, for example) without any accompanying specifics as to how these various possibilities and permutations of possibilities can be implemented (either individually or as part of a larger, complete system).

This is in violation of § 101 – the rejections must be directed to the claims. Further, the failure of the Examiner to properly construe the rejected claims (Section 7.2.6) compounds this violation.

In a teaching presentation, as in the instant application, it would be erroneous to teach an artisan that a function must be performed in a certain way when there are other ways to perform that function – it may be performed in that way or it may be performed in other disclosed ways.

The Examiner introduces many other issues of unclaimed subject matter. This includes the Examiner's requirement for the unclaimed "coherent" embodiment (Section 7.4.5) and it includes the Examiner's various other requirements for other unclaimed features; e.g.; "timing, synchronization and control" (prior Action at 58):

Particularly with regard to enablement, the specification does not describe any interconnections and interrelations between the disclosed image processing elements, including input-output characteristics, timing, synchronization and control that would enable one skilled in the art to make and use the invention without undue or unreasonable experimentation.

This despite the fact that the disclosure includes the details of the "timing, synchronization and control" for the actually reduced-to-practice "experimental" embodiment which has been disregarded by the Examiner. See Section 5.7. See also Sections 7.3.10, 7.3.16, 7.5.8, and 7.5.10.

Still further, the § 112-1 rejections seem to be directed to the form, not the substance, of the disclosure. However, in addition to the impropriety of the § 112-1 rejections based upon unclaimed subject matter, § 112-1 rejections based on the form of the disclosure is clearly prohibited.⁷⁶

Judge Radar stated in his concurring opinion in Alappat:⁷⁷

The Supreme Court has frequently cautioned that “courts should not read into the patent laws limitations and conditions which the legislature has not expressed.”...This same counsel applies to the Board.

Thus, basing the § 112-1 rejections upon non-statutory grounds, which is prohibited by § 101, is improper. Hence, the § 112-1 rejections should be reversed.

7.3.5.2 The So-Called “Example” Claim Is Not Representative And Thus Cannot Be Used As A Basis For Rejecting All Of The Other Claims

The Examiner selected a so-called “example” claim (Section 5.5) and based the § 112-1 rejections thereon. However, this single so-called “example” claim is not representative of the other claims. Thus, this single so-called “example” claim constitutes unclaimed subject matter for the many other claims that do not recite the limitations recited in the so-called “example” claim and thus it fails to establish a prima facie case for the other claims. For example, a simple comparison of this so-called “example” claim and other claims in the instant application shows that this so-called “example” claim is definitely not representative. See the claim chart below.

CLAIM CHART COMPARING THE SO-CALLED “EXAMPLE” CLAIM WITH ANOTHER CLAIM THAT IS UNDER APPEAL IN THE INSTANT APPLICATION

⁷⁶ In Re Sherwood, 613 F.2d 809, 204 USPQ 537, 544 n.6 (CCPA 1980).

⁷⁷ In re Alappat, 33 F.3d 1526, 31 USPQ2d 1545, 1591 (Fed. Cir. 1994).

| SO-CALLED “EXAMPLE” CLAIM | OTHER APPEALED CLAIM |
|--|---|
| <p>554. A process comprising the acts of: storing computer instructions; generating GPS navigation information in response to the computer instructions; generating radar information; generating data compressed image information in response to the computer instructions and in response to the radar information; and loading database information into a database memory in response to the computer instructions and in response to the radar information.</p> | <p>109. A process comprising the acts of: storing a prior 64-pixel block of image information, the prior 64-pixel block of image information representing a prior image; storing a next 64-pixel block of image information, the next 64-pixel block of image information representing a next image; generating prior motion vector information in response to the prior 64-pixel block of image information; generating next motion vector information in response to the next 64-pixel block of image information; and generating temporally interpolated image information by temporally interpolating between the prior motion vector information and the next motion vector information in response to the prior 64-pixel block of image information and in response to the next 64-pixel block of image information.</p> |

Even worse, the Examiner addresses only two limitations in the single “example” claim (e.g., GPS navigation and radar) which fails to establish a prima facie case for the other claim limitations recited in this so-called “example” claim and thus constitutes unclaimed subject matter for the other claim limitations (Sections 5.1 and 5.5).

Otherwise stated, the rejection of all of the other claims based upon the non-representative so-called “example” claim constitutes unclaimed subject matter. Further, because the so-called “example” claim is not representative of the other claims, the other claims stand rejected over unclaimed subject matter (e.g.; the disputed limitations in the so-called “example” claim (GPS and radar) that are not recited in many of the other claims).

Because of the Appellant’s showing that this so-called “example” claim is adequately disclosed (Sections 5.1 and 5.5) and because this single so-called “example” claim is not representative of the

other claims supra, for these reasons alone the Examiner's reliance on this so-called "example" claim is fatal to the § 112-1 rejections.

7.3.5.3 The § 112-1 Rejections Appear To Be Focused On Mechanical-Type Apparatus

Claims And Thus Are Not Relevant To The Instant Software-Type Process Claims

The Examiner creates an unclaimed subject matter issue by basing the § 112-1 rejections on the disclosure for mechanical-type apparatus claims and apparently disregarding the facts and the law on the disclosure needed for software-type process claims (instant Action at 14 regarding written description and prior Action at 24 regarding enablement; respectively (bold emphasis in original)):

Each pending claim recites a combination of individual claimed elements, where the elements are modified by their interrelations (e.g., the "in response to" language). That is, each pending claim as a whole (i.e., the claimed combination) defines a system whereby the claimed elements interact very specifically with one another according to the claimed interrelations. **The claimed elements are inextricably linked to each other by the claimed interrelations, thereby defining a symbiotic system of elements.**

Each pending claim recites various elements modified by mutual interrelations (e.g., the "in response to" language). Each claimed combination defines a system whereby the claimed elements interact very specifically with one another to produce results that are wholly dependent upon the claimed interrelations and interactions between the elements. While all of the pending claims are rejected on the grounds of lacking an enabling disclosure, an example of a currently pending, non-enabled claim will be cited to clearly explain the examiner's rationale. This same rationale has been applied to all of the pending claims, and all lack an enabling disclosure using the same analysis.

However, a significant number of the claims in the instant applications are process claims that do not recite such "elements" and a significant number of the claims recite software-related interrelations and interactions. Thus, the Examiner requires disclosures that are neither claimed nor required – e.g.; unclaimed subject matter. For example, see the so-called "example" claim below:

554. A process comprising the acts of:
storing computer instructions;

generating GPS navigation information in response to the computer instructions;
 generating radar information;
 generating data compressed image information in response to the computer
 instructions and in response to the radar information; and
 loading database information into a database memory in response to the
 computer
 instructions and in response to the radar information.

7.3.6 The Examiner Failed To Establish A Prima Facie Case

The Examiner fails to establish a prima facie case regarding the § 112 rejections. Instead, the Examiner attempts to shift his burden to the Appellant with erroneous and conclusory statements. The Examiner violates the law of the Federal Circuit by disregarding the significant evidence that the Appellant produced; e.g., a very detailed disclosure and an actually reduced-to-practice “experimental system”. See Section 5.7. See also Sections 7.3.10, 7.3.16, 7.5.8, and 7.5.10.

The Examiner does not provide the “substantial evidence” required to support the rejections. Instead, he relies on erroneous and conclusory statements, he disregards the law, he misrepresents the disclosure, and he disregards the disclosure as a whole.

The Deputy Assistant Commissioner for Patent Policy and Projects summarized the requirements to support a written description rejection:⁷⁸

The Revised Interim Guidelines emphasize that the examiner has the initial burden of presenting evidence or cogent technical reasoning to explain why persons skilled in the art would not recognize in the original disclosure a description of the invention defined by the claims. A description as filed is presumed to be adequate, unless or until sufficient evidence or cogent technical reasoning to the contrary has been presented by the examiner to rebut the presumption. The examiner, therefore must have a reasonable basis to challenge the adequacy of the Written description. In rejecting a claim, the examiner should set forth express findings of fact which identify the claim limitation at issue and establish a *prima facie* case by providing reasons, usually supported by documentary evidence, why a person skilled in the art at the time the

⁷⁸ Stephen G. Kunin, “Written Description Guidelines and Utility Guidelines,” Journal of the Patent and Trademark Office Society (JPTOS), Vol. 82, No. 2 at pages 90-91 (February 2000).

application was filed would not have recognized that the inventor was in possession of the invention as claimed in view of the disclosure of the application as filed. The revision specifically notes that a general allegation of “unpredictability in the art” is not a sufficient reason to support a rejection for lack of adequate written description.

However, the Examiner failed to meet these requirements. The rejections do not establish a prima facie case. Instead, they violate the law of the U.S. Supreme Court and the Federal Circuit (Section 7.2.4) which requires the Examiner to consider the disclosure as a whole “taking into account evidence that ... detracts from an agency’s decision”. The Examiner fails to establish a prima facie case regarding the § 112 rejections. Instead, the Examiner attempts to shift his burden to the Appellant with erroneous and conclusory statements. The Examiner violates the law of the Federal Circuit by disregarding the significant evidence that the Appellant produced; e.g., a very detailed disclosure and an actually reduced-to-practice “experimental system”. See Section 5.7. See also Sections 7.3.10, 7.3.16, 7.5.8, and 7.5.10.

The § 112-1 rejections do not establish a prima facie case.⁷⁹

- a. The § 112-1 rejections do not provide the required “acceptable evidence or reasoning” (Section 7.3.3).
- b. The § 112-1 rejections fail to consider the disclosure as a whole (Section 7.3.7).
- c. The § 112-1 rejections do not provide the required “substantial evidence” (Section 7.2.2).
- d. The most relevant parts of the disclosure are ignored. (e.g., Section 5).
- e. The § 112-1 rejections do not properly explain why claim terminology allegedly lacks written description in view of the extensive disclosure and the many occurrences of the claim terminology in the disclosure.
- f. The Appellant properly traversed the Examiner’s unsupported statements, but the Examiner did not provide the required reference or affidavit in accordance with MPEP 2144.03.

⁷⁹ See 37 CFR 1.106(b); Chester v. Miller, 906 F.2d 1574, 1578, 15 USPQ2d 1333, 1337 (Fed. Cir. 1990) (“Section 132 is violated when a rejection is so uninformative that it prevents the applicant from recognizing and seeking to counter the grounds for rejection.”). See also In re Oetiker, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992).

g. The § 112-1 enablement rejections misrepresent the skill in the art (Section 7.5.6).

The burden of establishing a prima facie case rests with the examiner and is not satisfied by conclusory statements.⁸⁰

The § 112-1 rejections are based upon erroneous conclusory statements. Thus, the rejections fail to provide the “substantial evidence” required by the U.S. Supreme Court and the Federal Circuit (Section 7.2.2). Such erroneous conclusory statements are not evidence and are expressly discouraged by the Federal Circuit (Section 7.2.3).

Judge Lindquist in Hyatt-’053⁸¹, in reversing an enablement rejection under § 112-1, stated:

OPINION ...

If the examiner had a reasonable basis for questioning the sufficiency of the disclosure, the burden shifted to the appellant to come forward with evidence to rebut this challenge. In re Doyle, 482 F. 2d 1385, 179 USPQ 227, (CCPA 1973); In re Brown, 477 F.2d 946, 177 USPQ 691 (CCPA 1973); In re Ghiron, 58 CCPA 1207, 442 F.2d 985, 169 USPQ 723 (1971). However, the burden was initially upon the examiner to establish a reasonable basis for questioning the adequacy of the disclosure. In re Strahilevitz, 668 F.2d 1229, 212 USPQ 561 (CCPA 1982); In re Angstadt, 537 F.2d 498, 190 USPQ 214 (CCPA 1976); In re Armbruster, 512 F.2d 676, 185 USPQ 152 (CCPA 1975).

Here, we are not convinced that the examiner has discharged his initial burden. The examiner alleges that the disclosure fails to set forth “specific details” of the various embodiments of the claimed invention. However, “blueprints” of the several embodiments are not required to satisfy the enablement clause. The examiner has not said what “specific details” he thinks would be necessary to satisfy the enablement requirement. Nor has the examiner addressed the “undue experimentation” aspect of enablement other than to just conclude that undue experimentation would be required for enablement. We will not sustain the rejection.

See also Hyatt-’444⁸² regarding a consistent decision of the PTO Board.

⁸⁰ In re Edwards, 568 F.2d 1349, 1354, 196 USPQ 465, 469 (CCPA 1978); In re Oetiker, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992).

⁸¹ Ex parte Hyatt, Appeal No. 532-38, Paper No. 32 at 2-3 in patent application Serial No. 05/948,053 (PTO Bd. App. April 20, 1984) [herein Hyatt-’053] (unpublished PTO decision).

The Examiner does not properly consider the most relevant parts of the disclosure and misrepresents the disclosure. The § 112-1 rejections do not properly acknowledge the extensive verbatim and literal basis in the disclosure. See the numerous occurrences of claim terminology in the disclosure (Section 5.4).

The claims are all rejected together as a group of claims all rejected based upon a single so-called “example” claim. This is improper. In order to establish a prima facie case, each disputed claim must be evaluated individually to determine whether that claim individually meets the § 112-1 requirement. Since the Examiner did not evaluate each of the disputed claims individually, the § 112-1 rejections fail to establish a prima facie case. See Van Geuns and Wright.⁸³ See also Nielson and Beaver.⁸⁴

Furthermore, the Examiner must support § 112-1 rejections with a proper explanation of why the disclosure is not adequate and must provide “acceptable evidence or reasoning” to support a finding of lack of adequate disclosure (Section 7.3.3). However, the § 112-1 rejections do not provide a proper explanation or “acceptable evidence or reasoning” regarding the adequacy of the instant disclosure, but instead primarily rely on erroneous and conclusory statements.

The Examiner misrepresented the skill in the art (e.g.; prior Action at 33, 43, 45, and 58). Clearly, the Examiner should have analyzed the skill in the art as it relates to the rejections and the disclosure. For example, the skill in the computer and programming arts were high (Section 7.5.6.1) where a prior art programmer would have been able to program the claimed (and disclosed) functions with the disclosed computer.

The Examiner did not meet the requirements of Gechter.⁸⁵

⁸² Ex parte Hyatt, Appeal No. 636-62, Paper No. 48 at 3-4 in patent application Serial No. 07/874,444 (PTO Bd. App. October 30, 1986) [herein Hyatt-444] (unpublished PTO decision).

⁸³ In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993); In re Wright, 999 F.2d 1557, 27 USPQ2d 1510 (Fed. Cir. 1993).

⁸⁴ In re Nielson, 816 F.2d 1567, 2 USPQ2d 1525 (Fed. Cir. 1987); In re Beaver, 893 F.2d 329, 13 USPQ2d 1409 (Fed. Cir. 1989).

⁸⁵ Gechter v. Davidson, 43 USPQ2d 1030, 1035 (Fed. Cir. 1997).

In the present case, the Board's opinion lacks a claim construction, makes conclusory findings relating to anticipation, and omits any analysis on several limitations. For example, the Board opinion does not separately construe the term "agent status messages" before finding that Canale discloses just such "agent status messages." In addition, the Board never construed the scope of the structures disclosed in the specification for the claimed "receiving means," nor did the Board expressly find that the "receiving means" disclosed in the specification was structurally equivalent to that embodied in Canale. Moreover, the Board's opinion also failed to define the exact function of the receiving means, as well as to find that Canale disclosed the identical function.

* * *

In Bond, this court vacated the Board's anticipation decision because it failed to make one particular subsidiary finding. In that case, the Board determined that a prior art reference anticipated the applicant's claimed telephone answering machine, finding that the reference disclosed the claimed "delay means." 910 F.2d at 833, 15 USPQ2d at 1568. The delay means disclosed in the reference, however, was not identical to the delay means in the specification. This court vacated the Board's anticipation decision because the Board made no specific finding that, pursuant to 35 U.S.C. § 112, ¶ 6 (1994), the delay means in the specification and that embodied in the prior art reference were structurally equivalent. Id. Here, the Board's opinion omits not one, but several crucial findings. We therefore must vacate and remand.

CONCLUSION

In sum, we hold that the Board is required to set forth in its opinions specific findings of fact and conclusions of law adequate to form a basis for our review. In particular, we expect that the Board's anticipation analysis be conducted on a limitation by limitation basis, with specific fact findings for each contested limitation and satisfactory explanations for such findings. Claim construction must also be explicit, at least as to any construction disputed by parties to the interference (or an applicant or patentee in an ex parte proceeding).

Moreover, Judge Plager, in his concurring opinion in Oetiker⁸⁶, stated:

The process of patent examination is an interactive one. See generally, Chisum, Patents, § 11.03 et seq. (1992). The examiner

⁸⁶ In re Oetiker, 977 F.2d 1443, 1449, 24 USPQ2d 1443, 1447 (Fed. Cir. 1992).

cannot sit mum, leaving the applicant to shoot arrows into the dark hoping to somehow hit a secret objection harbored by the examiner.

In a related appeal in Hyatt '355,⁸⁷ Judge Barrett clarified the PTO position on unsupported conclusory statements:

Our reviewing court, the U.S. Court of Appeals for the Federal Circuit, has no way of verifying those facts from the record; **our assertions are not evidence**.

Hence, if the Board's assertions are not evidence, the Examiner's erroneous and conclusory statements are certainly not evidence and hence do not establish a prima facie case.

The Examiner does not properly address experimentation -- whether there is any experimentation at all much less whether there is undue experimentation. This is particularly troubling in view of the established case law on this issue (Section 7.5.8). For example, the Examiner did not properly consider the actually reduced-to-practice "experimental system" (e.g.; Sections 5.7 and 7.3.10) nor the law and the facts on experimentation (Section 7.5.8). Further, the Examiner's Wands analysis is fatally defective (Section 7.5.9). See the Appellant's Wand's analysis (Section 7.5.9). Still further, the Examiner did not properly consider the disclosure of the many different "working examples" (Section 7.5.10) nor the disclosure of "specific information", both of which the CCPA established as being important disclosures:⁸⁸

The same principle should apply to claims covering a wide range of distinct chemical compounds. However, because of the proportion of unknown compounds it will ordinarily be necessary to give **many more examples** and much more **specific information** than would be necessary in the case of an alloy or a mixture.

Despite the fact that the instant claims are not directed to such "unknown compounds", the instant disclosure still provides "many examples" and much "specific information" as suggested by the CCPA in Cavallito for disclosures that do have such "unknown compounds".

The CCPA stated with approval that Sichert sets forth "numerous examples":⁸⁹

⁸⁷ Ex parte Hyatt, Appeal No. 1994-3042, Paper No. 39 at 36 in patent application Serial No. 07/289,355 (PTO Bd. App. December 21, 2000) [herein Hyatt-'355] (unpublished PTO decision) (emphasis added).

⁸⁸ In re Cavallito and Gray, 282 F.2d 363, 127 USPQ 202, 205 (CCPA 1960) (emphasis added).

⁸⁹ In re Sichert, 566 F.2d 1154, 1164, 196 USPQ 209, 217 (CCPA 1977).

Moreover, appellant's specification sets forth numerous examples, many with exact doses and a discussion regarding the method of treatment.

However, the present Examiner did not properly consider the "numerous examples" in the instant disclosure. See Sections 7.5.10.1 to 7.5.10.5 for a discussion of legal "examples" in the instant disclosure. Because the Examiner failed to properly consider the "numerous examples" in the disclosure, for this reason alone he failed to establish a prima facie case of lack of enablement. And the adequacy of the instant disclosure is significantly enhanced in view of the predictability of the electronics art, in direct contrast to the unpredictability of Cavallito's chemical art (excerpted above).

The Deputy Assistant Commissioner for Patent Policy and Projects summarized the requirements to support a written description rejection:⁹⁰

The Revised Interim Guidelines emphasize that the examiner has the initial burden of presenting evidence or cogent technical reasoning to explain why persons skilled in the art would not recognize in the original disclosure a description of the invention defined by the claims. A description as filed is presumed to be adequate, unless or until sufficient evidence or cogent technical reasoning to the contrary has been presented by the examiner to rebut the presumption. The examiner, therefore must have a reasonable basis to challenge the adequacy of the Written description. In rejecting a claim, the examiner should set forth express findings of fact which identify the claim limitation at issue and establish a *prima facie* case by providing reasons, usually supported by documentary evidence, why a person skilled in the art at the time the application was filed would not have recognized that the inventor was in possession of the invention as claimed in view of the disclosure of the application as filed. The revision specifically notes that a general allegation of "unpredictability in the art" is not a sufficient reason to support a rejection for lack of adequate written description.

However, the Examiner failed to meet these requirements. Thus, for this reason alone, the Examiner failed to establish a prima facie case of lack of written description.

The Appellant developed his position with reasoning and evidence and traversed the Examiner's unsupported and conclusory statements, yet the Examiner did not provide a reference or affidavit in

⁹⁰ Stephen G. Kunin, "Written Description Guidelines and Utility Guidelines," Journal of the Patent and Trademark Office Society (JPTOS), Vol. 82, No. 2 at pages 90-91 (February 2000).

support of his position as required by MPEP 2144.03. Further, the Examiner's unsupported and conclusory statements are "in areas of esoteric technology" and hence should have been supported by a citation to a reference (MPEP 2144.03), but were not thusly supported.

In view of the above, the § 112-1 rejections do not establish a prima facie case. Hence, the § 112-1 rejections should be reversed.⁹¹

7.3.7 The Examiner Failed To Consider The Disclosure As A Whole

The Examiner is required to but did not consider the disclosure as a whole:

The specification as a whole conveys possession of the claimed invention as of the filing date. The description requirement of the first paragraph of § 112 is accordingly satisfied.

Smith⁹²

Considering the language of the statute, it should be evident that these inquiries include determining whether the subject matter defined in the claims is described in the specification, whether the specification disclosure as a whole is such as to enable one skilled in the art to make and use the claimed invention, and whether the best mode contemplated by the inventor of carrying out that invention is set forth."

Univ. of Rochester.⁹³ However, instead of considering the disclosure as a whole, the Examiner did not properly consider many important parts of the disclosure; the numerous occurrences of the claim limitations in the disclosure, the top-down end-to-end nature of the disclosure (e.g.; Section 5.6), and the "experimental system" (Sections 5.7, 7.3.10, 7.3.16, 7.5.8, and 7.5.10); yet the Examiner alleged insufficient disclosure. If the Examiner had considered the disclosure as a whole, he would have found more than adequate support for the claims.

⁹¹ In re Oetiker, 977 F.2d 1443, 24 U.S.P.Q.2d 1443 (Fed. Cir. 1992).

⁹² In re Smith, 481 F.2d 910, 178 USPQ 620, 624 (CCPA 1973) (emphasis added).

⁹³ Univ. of Rochester v. G.D. Searle & Co., 69 USPQ2d 1886, 1890 (2004) (quoting In re Moore, 439 F.2d 1232, 1235, 169 USPQ 236 (CCPA 1971)).

The instant application is significant, comprising significant disclosure with **detailed diagrams** in schematic and block diagram form. However, the Examiner has not properly considered the disclosure as a whole as required by the courts.⁹⁴ Further, the Examiner has not properly considered the large number of occurrences of the claim terminology in the verbal description (Section 5.4). Hence, the Examiner has failed to consider the disclosure as a whole and certainly has not established a prima facie case under § 112-1.

7.3.8 The Examiner Alleges Insufficient Disclosure While Ignoring Hundreds Of Relevant Recitations In The Disclosure

The claim terminology has extensive basis in the disclosure. For example, there are numerous occurrences of claim terminology and detailed disclosures thereof. See, e.g., Tables 5.1 et seq. (Section 5). The Examiner cannot establish a prima facie case for the § 112-1 rejections unless he evaluates the occurrences of this claim terminology in the disclosure. The “experimental system” embodiment, described in detail in the verbal description (e.g.; Spec. at 240-373) and shown in detail in the figures (e.g.; Figs. 6A to 6AH), represents a detailed disclosure of an actually reduced-to-practice embodiment interconnected together and operable (Sections 5.7 and 7.3.10). The Examiner has not indicated how many occurrences of a term he requires before the term is considered to be adequately disclosed. However, the law of the Federal Circuit does not even require a single verbatim recitation or literal recitation in order to satisfy § 112-1 (Section 7.4.7). Hence, the various verbatim and near-verbatim recitations are certainly adequate.

The Table of Contents (Section 9.1) further illustrates the extensive disclosure in a top-down format (indented section titles), including the “experimental system” (e.g.; Sections 5.7 and 7.3.10).

In view of the above, the disclosure has numerous recitations that supports written description and the disclosure has extensive legal “examples” that supports enablement which were not properly considered by the Examiner. Hence, the 112-1 rejections should be reversed.

⁹⁴ In re Moorg, 439 F.2d 1232, 169 USPQ 236 (CCPA 1971); In re Hogan, 559 F.2d 595, 194 USPQ 527 (CCPA 1977).

7.3.9 The Examiner Misrepresents The Disclosure And Violates The Law Of The U.S. Supreme Court And The Law Of The Federal Circuit

The Examiner has not properly considered the disclosed actually reduced-to-practice “experimental system” (e.g.; Section 5.7) yet he contends insufficient disclosure. This is a violation of the law of the U.S. Supreme Court and the Federal Circuit (Section 7.2.4). The Examiner must consider the disclosure as a whole “taking into account evidence that ... detracts from an agency’s decision”.

The [U.S. Supreme] Court has emphasized that “substantial evidence” review involves examination of the record as a whole, taking into account evidence that both justifies and detracts from an agency’s decision. See Universal Camera Corp. v. NLRB, 340 U.S. 474, 487-88 (1951).

Gartside.⁹⁵ Because the Examiner violated the law of the U.S. Supreme Court and the Federal Circuit and disregarded the Appellant’s evidence, for this reason alone the § 112-1 rejections should be reversed.

The CCPA’s criticism of the best mode rejection in Sichert also applies well to the § 112-1 rejections in the instant application:⁹⁶

Moreover, appellant’s specification sets forth numerous examples, many with exact doses and a discussion regarding the method of treatment. The examiner’s conclusory statement that the specification does not teach the best mode of using the invention is unaccompanied by evidence or reasoning and is entirely inadequate to support the rejection.

As in Sichert, the instant “specification sets forth numerous examples” many with “exact” circuitry and programs that were actually reduced-to-practice “and a discussion regarding the method” As in Sichert, “[t]he examiner’s conclusory statement that the specification does not teach the ... invention is unaccompanied by [proper] evidence or reasoning and is entirely inadequate to support the rejection.”

⁹⁵ In re Gartside, 53 USPQ2d 1769, 1773 (Fed. Cir. 2000).

⁹⁶ In re Sichert, 566 F.2d 1154, 1164, 196 USPQ 209, 217 (CCPA 1977).

7.3.10 The PTO Confirms That Disclosures Such As The Actually Reduced-To-Practice “Experimental System” Are Very Significant To § 112-1

The Appellant actually reduced-to-practice and disclosed in detail an “experimental system” (e.g.; Section 5.7). This is very important to § 112-1. However, the Examiner did not properly consider and he misrepresents the disclosure of this “experimental system”. Hence, for this reason alone, the § 112-1 rejections fail to establish a prima facie case.

The disclosure of the “experimental system” is extensive (Section 5.7). The Appellant even produced video tapes to the PTO under the Disclosure Document program, incorporated these video tapes by reference into the instant application, and discussed these video tapes and the demonstrations recorded thereon in the instant specification (Spec. at 146-150). See Sections 7.3.10, 7.3.16, 7.5.8, and 7.5.10.

However, the Examiner did not properly consider these video tapes.

According to the Deputy Assistant Commissioner for Patent Policy and Projects,⁹⁷ such a reduction-to-practice is particularly relevant to the issue of § 112-1:

If a specification demonstrates actual reduction to practice by showing that the inventor constructed an embodiment or performed a process that met all the limitations of the claim and determined that the invention would work for its intended purpose, one skilled in the art would clearly recognize that the applicant was in possession of the claimed invention.

The Assistant Commissioner cites to Cooper⁹⁸ for an authority.

7.3.11 The Nature Of The Computer Art And How A Computer Artisan Would Perceive The Instant Disclosure

The Examiner appears to require the instant computer system related disclosure to look like a mechanical-type disclosure (Section 7.3.5.3). However, computer technology does not lend itself to

⁹⁷ Stephen G. Kunin, “Written Description Guidelines and Utility Guidelines,” Journal of the Patent and Trademark Office Society (JPTOS), Vol. 82, No. 2 at page 86 (February 2000).

⁹⁸ Cooper v. Goldfarb, 154 F.3d 1321, 1327, 47 USPQ2d 1896, 1901 (Fed. Cir. 1998).

mechanical-type disclosures. For example, computer systems are time shared, are iterative, use intermixed combinations of software and hardware, and have multiple functions implemented on a single integrated circuit chip. Thus, analysis of computer disclosures must be based upon the functions performed, not merely based upon physical interfaces.

Regarding physical interconnections, computer systems often do not lend themselves to analyses as if the interconnections were simple mechanical-type interconnections. As above, computer systems are time shared, are iterative, use intermixed combinations of software and hardware, and have multiple functions implemented on a single integrated circuit chip. Thus, a function associated with a particular interconnection may be a temporal variable, it may be performed both before and after another function due to iterative processing (round and round, over and over again). Further, software interconnections tend to be "virtual" (not physical) interconnections because they are embedded into and associated with the computer operations. For example, software interconnections are implicit in the sequence of the instructions and the jump nature of certain instructions without classical dedicated wires or mechanical type features. Thus, the Examiner's stressing of strict, rigid, fixed interconnections is often not relevant to computer systems.

Computer technology, for the above reasons, does not lend itself to mechanical-type block diagrams. In iterative computer systems, as with the instant system, information flow is complex and software and time shared interconnections are numerous. Attempting to force such a computer system into a mechanical-type interconnection concept defies logic.

Further, the person to be addressed is an artisan in the relevant art (e.g.; a computer systems artisan). For example, Fig. 1A shows the computer (Supervisory Processor 110R) interconnected to numerous other blocks. It is common for the computer to perform many different functions under program (software) control on an iterative (looping basis) and time sharing hardware to perform various functions in digital systems as in the present case, software and hardware are often intermixed in the performance of a function, are often iterative, and are often time shared and thus may not have defined boundaries upon which a patent professional can draw a block around. Thus, as here, it is common in the art to name circuitry by the function it performs and it is common in the art to have processing associated with hardware and software functions.

The MPEP confirms that “[s]oftware aspects of inventions may be described functionally”.⁹⁹

The claimed invention subject matter need not be described literally, i.e., using the same terms, in order for the disclosure to satisfy the description requirement. Software aspects of inventions may be described functionally. See *Robotic Vision Sys. v. View Eng'g, Inc.*, 112 F.3d 1163, 1166, 42 USPQ2d 1619, 1622-23 (Fed. Cir. 1997); *Fonar Corp. v. General Electric Co.*, 107 F.3d 1543, 1549, 41 USPQ2d 1801, 1805 (Fed. Cir. 1997); *In re Hayes Microcomputer Prods., Inc.*, 982 F.2d 1527, 1537-38, 25 USPQ2d 1241, 1248-49 (Fed. Cir. 1992).

However, the Examiner misrepresents the extensive functional disclosures of the “[s]oftware aspects” in the instant disclosure.

The CCPA in Sherwood established that “the touchstone [for § 112-1] is the content, not the form”, and that § 112-1 can even be satisfied with a “verbal flow chart” (e.g.; Section 7.5.6.1).¹⁰⁰ See also, e.g., Section 7.3.11 for a discussion of software disclosure.

Despite the above-discussed facts and law regarding computer systems, the Examiner persists in treating the instant disclosure as if it were a mechanical-type disclosure (see below).

The Examiner misrepresents the computer system nature of the figures (prior Action 34) (emphasis added) (original emphasis omitted):

The applicant's original disclosure fails to provide any detail whatsoever regarding the interconnections and interrelations between the claimed elements. The details of the signal format required between the elements in the applicant's disclosed invention is completely lacking.

However, despite the fact that the law permits software inventions to be disclosed functionally, “the claimed interconnections and interrelations between the individual claim elements” are also disclosed in detail in apparatus form (e.g.; Section 5.2 and Tables 5.2 et seq; see also Figs. 6A-6AH). Thus, the Examiner is wrong on both the law and the facts.

Despite the software nature of many of the claim limitations and despite the fact that the law permits software inventions to be disclosed functionally, the Examiner is preoccupied with the

⁹⁹ MPEP at § 2106, in discussing compliance with the written description requirement at B.1. (pp. 2100-20; Revision 2, May 2004).

¹⁰⁰ In Re Sherwood, 613 F.2d 809, 204 USPQ 537, 544-545 n.8 (CCPA 1980).

“interconnection” of “elements” regarding both written description and enablement. See, e.g.; instant Action at 16, 17, and 24 and prior Action at 12,13,34, and 58; respectively (bold underline emphasis added):

In order to determine, and where written description support for the example claim exists, the examiner is looking to the original disclosure for:

- A coherent embodiment that describes [sic] the entire combination of claimed elements, along with the **interconnections and interrelations** between them

The specification was read for any coherent or even partial embodiment (with suggestions, or guides) that describes the structure and functional **interconnections and interrelations** of the example claim.

In summary, upon a thorough reading the applicant's specification from the standpoint of one with no foreknowledge of the now claimed invention, the examiner did not find:

- A coherent embodiment that describes [sic] the entire combination of claimed elements, along with the **interconnections and interrelations** between them

There is no explicit, implicit, or inherent teaching in the original disclosure of combining these disparate claim elements in a single, **interconnected and interrelated** system in the manner claimed. There are no single, self-contained embodiments of the original disclosure that integrate these disparate claimed elements, having the claimed **interconnections and interrelations**.

In summary, the originally filed disclosure does not explicitly, implicitly, or inherently describe or otherwise suggest the claimed combinations as a whole, including all of the claimed **interconnections and interrelations**.

The applicant's original disclosure fails to provide any detail whatsoever regarding the interconnections and interrelations between the claimed elements.

Particularly with regard to enablement, the specification does not describe any interconnections and interrelations between the disclosed image processing elements, including input-output characteristics, timing, synchronization and control that would enable one skilled in the art to make and use the invention without undue or unreasonable experimentation.

For these reasons alone, (a) that the law condones functional disclosures for software inventions and (b) that the disclosure provides the details of the hardware embodiment of the software implemented computer system, the Examiner has failed to establish a prima facie case of lack of written description and the Examiner has failed to establish a prima facie case of lack of enablement. Thus, the §112-1 rejections should be reversed.

7.3.12 The Examiner Misrepresents The Disclosure Of Alternate Embodiments And Disregards The Law On Alternate Embodiments

7.3.12.1 The Examiner Misrepresents The Fig. 1A “Self-Contained Embodiment” As Being A Plurality Of Alternate (Option) Embodiments

Despite the fact that the disclosure of alternate embodiments is important to the § 112-1 requirement (Sections 7.3.12.2 and 7.3.12.4), the Examiner misrepresents the Fig. 1A “self-contained embodiment” as being a plurality of alternate (option) embodiments. However, this disclosure is specifically described as being a single “self-contained embodiment” (Spec. at 17):

The present invention can be used in many applications. One general purpose modular configuration is shown in Figs 1A to 1G and summarized in the MODULAR CONFIGURATION FEATURES TABLE herein. Various other configurations can also be provided.

Instead, the Examiner misrepresented this Fig. 1A related disclosure as being optional embodiments¹⁰¹ rather than the parts of the same Fig. 1A “self-contained embodiment”. See the instant Action at 6-8. See particularly the instant Action at 6 (***bold italics emphasis in original***) (***emphasis added***):

The disclosed invention appears to be several generalized image processing architectures having numerous **optional capabilities**. The specification is a description of several **optional architectures** (e.g., **Figures 1A-1D and 1F-1O**), each architecture having numerous **optional** inputs, supervisory functions, geometric processing capabilities, spatial processing capabilities, multiplexing capabilities, and outputs (e.g., the **tables at specification pages 24-30** describe many of these **options**), with miscellaneous descriptions of image processing operations scattered throughout (and not seemingly related to each other). *The specification lacks coherent embodiments and cohesive descriptions that tie the architecture, hardware options and/or miscellaneous processing descriptions together in a manner that describes the claimed inventions.* This is the primary basis for the written description rejections advanced herein. Examples of the architecture, hardware options and miscellaneous processing descriptions are provided immediately below.

The Examiner should not have based the § 112-1 rejections on the disclosure of alternate (optional) embodiments, but instead should have properly considered the disclosed alternate embodiments as enhancing the disclosure. Thus, the Examiner failed to establish a prima facie case regarding the § 112-1 rejections. Hence, for this reason alone, the § 112-1 rejections should be reversed.

7.3.12.2 The Disclosure Of Alternate Embodiments Is Not Only Condoned By The Courts But Is Implicitly Necessitated By The Courts

Consistent with well-established practice and established case law, the instant application discloses alternate embodiments.

The disclosure of alternate embodiments is well-established patent drafting practice, it is condoned by the courts, and it is even necessitated by the case law. Judge Michel of the Federal Circuit suggested for the preparation of patent applications “[d]escribe multiple embodiments wherever

¹⁰¹ The Examiner uses the term “optional...” which is believed to be his term for “alternate” embodiment.

possible.”¹⁰² It is common patent drafting practice to disclose one or more preferred embodiments and various alternate embodiments. See, e.g., Berkeley Technical Law Journal at 157.¹⁰³

In addition, patent drafters should disclose as many alternative embodiments as possible....

See also Legal Eagle.¹⁰⁴

Indeed, **Multiple embodiments** may be critical to obtaining a proper scope of protection. If the description has only one example, many patent examiners will try to narrow the claims to that example. To illustrate; if the description discloses only iron, they will try to confine the claims to “iron”, if it discloses iron and aluminum, it can probably claim “metal.” Two or three specific embodiments of your solution are generally worth more than one embodiment and many broad assertions. Moreover, **multiple embodiments** lend credibility to broad assertions.

The instant disclosure is consistent with recommended drafting practice.¹⁰⁵

Patent attorneys would be well advised to omit the “objects of the invention” section of a specification and list several alternative embodiments in the specification. In addition, inventors may have to expend time and money to create routine variations obvious to one skilled in the art so that patent attorneys would have sufficient alternative embodiments to satisfy the Gentry omitted element test. This expenditure of inventor’s time may result in lost opportunity costs for the inventors to innovate.

¹⁰² John Orange, “Judge Paul Michael’s Top Ten Drafting Tips,” Federation Internationale Des Conseils En Propriete Industrielle, Newsletter #50 (June 2002) available at <http://www.ficpi.org/newsletters/50/Tips.html> (last visited June 16, 2005).

¹⁰³ Thomas M. Hardman, Berkely Technology Law Journal Annual Review of Law and Technology, Berkeley Technical Law Journal, 15 Berkeley Tec. L.J. 147, 157 (2000).

¹⁰⁴ Glen E. Booksand and Stuart D. Sender, Patenting to Win, Legal Eagle, NJ Technology Council and the Education Foundation, Vol. 5, Issue 4 (May 2001) (emphasis added).

¹⁰⁵ Cindy I. Liu, INTELLECTUAL PROPERTY, 14 Berkeley Tech. L.J. 123, 134 (1999) (footnotes omitted) (emphasis added).

Because the inventor in the instant application expended the time to provide alternate embodiments, he should be given full benefit of the disclosed alternate embodiments and not, as here, be penalized for his disclosure of alternate embodiments.

The need to disclose alternate embodiments is well-established in the case law. The case law not only condones the disclosure of alternate embodiments but also provides special benefits regarding the disclosure of alternate embodiments and implicitly necessitates the disclosure of alternate embodiments. For example, as discussed below, alternate embodiments provide beneficial claim construction, provide beneficial means-plus-function interpretation, help avoid the limitation of an “essential” element, permit greater claim breadth, provide favorable interference opportunities, promote reissue opportunities, help avoid prior art cited by a patent examiner, and can be defensive (e.g., limit a competitor from designing around the invention). Thus, it would appear to be necessary for a patent application to disclose alternate embodiments.

Claim construction and written description are enhanced by disclosure of alternate embodiments. For example, in Clearstream¹⁰⁶, Judge Plager commented, in describing an earlier case of the Federal Circuit, that

[T]he claim could indeed cover alternative embodiments described in the written description

The Federal Circuit further confirms that the written description includes the disclosed alternative embodiments. The Federal Circuit stated in Serrano.¹⁰⁷

Disclosed structure includes **that which is described** in a patent specification, **including any alternative structures identified**

In particular, the application disclosed a discrete logic preferred embodiment and further disclosed:
... "it should be recognized to those of ordinary skill in the art that a microprocessor-based system could also be used wherein the logical decisions are configured in software."

Serrano.¹⁰⁸ Based upon this simple statement, the court found that the specification sufficiently disclosed an alternative embodiment implemented using a microprocessor operating under software control. This

¹⁰⁶ Clearstream Wastewater v. Hydro-Action, 206 F.3d 1440, 54 USPQ2d 1185, 1189 (Fed. Cir. 2000) (citing Signtech v. Yutek, 174 F.3d 1352, 50 USPQ2d 1372 (Fed. Cir. 1999)).

¹⁰⁷ Serrano v. Telular Corp., 111 F.3d 1578, 1582-1583, 42 USPQ2d 1538, 1542 (Fed. Cir. 1997) (emphasis added).

is particularly compelling in the instant disclosure which discloses much more; e.g., it includes extensive software disclosures and extensive disclosures of alternate embodiments.

Claim construction and means-plus-function interpretation are enhanced by disclosure of alternate embodiments. For example, in Clearstream¹⁰⁹, Judge Plager further commented, in describing a holding from a 1999 Federal Circuit case, that

[The] district court erroneously overlooked alternative embodiments of the invention when it concluded that the means-plus-function clause could only cover the structure of the preferred embodiment.

The Federal Circuit supported its decision in Serrano (Section 7.3.12.5) and confirmed the need for alternative structures in Ishida.¹¹⁰

This court has encountered means-plus-function elements in other patents that disclosed **alternative structures** for accomplishing the claimed function ... In Serrano, this court determined that the district court had erroneously limited the structure corresponding to the claimed function to only one of the **alternative structures** in the specification. Serrano states that proper application of § 112 ¶ 6 generally reads the claim element to embrace distinct and **alternative described structures** for performing the claimed function. Specifically, '[d]isclosed structure includes that which is **described** in a patent specification, **including any alternative structures identified**.'

Interpretation of § 112-6 involves the written description in the disclosure. See Ishida above. See also 35 U.S.C. 112, Sixth Paragraph (emphasis added):

An element in a claim for a combination may be expressed as a means or step for performing a specific function ... and such claim shall be construed to cover the corresponding structure ... **described** in the specification and equivalents thereof.

See also MPEP 2181.¹¹¹ See also Signtech for the Federal Circuit's treatment of an alternative embodiment regarding § 112-6.¹¹²

¹⁰⁸ Serrano v. Telular Corp., 111 F.3d 1578, 1583, 42 USPQ2d 1538, 1542 (Fed. Cir. 1997) (quoting Patent No. 4,922,517, col. 10, lines 46-50).

¹⁰⁹ Clearstream Wastewater v. Hydro-Action, 206 F.3d 1440, 54 USPQ2d 1185, 1190 (Fed. Cir. 2000) (citing Micro Chemical, Inc. v. Great Plains, 194 F.3d 1250, 52 USPQ2d 1258 (Fed. Cir. 1999)).

¹¹⁰ Ishida v. Taylor, 55 USPQ2d 1449 at 1452-53 (Fed. Cir. 2000) (emphasis added).

The Federal Circuit's decision in Gentry¹¹³ stands for the proposition that:

[C]laims may be no broader than the supporting disclosure, and therefore that a narrow disclosure will limit claim breadth.

In Gentry, the invention was directed to a reclining chair disclosing recliner controls that were located on the console and nowhere else. Later, Gentry broadened certain claims to eliminate the requirement that the controls be situated only on the console. Those claims were found to be invalid because the disclosure only taught controls mounted on the console. If Gentry had disclosed alternate embodiments of the location of the controls, it likely would have succeeded with its broader claims.

Claim construction and interference practice are enhanced by disclosure of alternate embodiments. For example, in Byrne¹¹⁴, the CCPA commented in banc:

The present application clearly discloses **an alternative construction embodying** the combination of count 4. Consequently, it supports that count and also the less limited combinations of counts 3 and 5.

Interpretation of an interference count involves the written description in the disclosure. See Squires addressed in Section 7.3.12.4 herein.

The Federal Circuit in Utter specifically contrasted two disclosures, one with multiple embodiments and the other without multiple embodiments.¹¹⁵

Utter's application disclosed **two preferred embodiments**, an "internal pivot" and an "external pivot" configuration. Hiraga disclosed the internal pivot as the preferred embodiment, and did not specifically disclose the external pivot.

¹¹¹ MPEP § 2181 at 2100-223 (Rev. 2, May 2004).

¹¹² Signtech USA, Ltd. v. Vutek, Inc., 174 F.3d 1352, 50 USPQ2d 1372 (Fed. Cir. 1999).

¹¹³ Gentry Gallery v. Berkline, 134 F.3d 1473, 45 USPQ2d 1498 (Fed. Cir. 1998).

¹¹⁴ Byrne v. Trifillis, 442 F.2d 1390, 170 USPQ 32, 34 (CCPA 1971) (emphasis added).

¹¹⁵ Utter v. Hiraga, 6 USPQ2d 1709, 1711 (Fed. Cir. 1988) (emphasis added).

Thus, it is appropriate and even necessary for patent disclosures to include alternate embodiments to obtain suitable patent protection. Consistent therewith, the instant application discloses numerous alternate embodiments.

Various ones of the advantages of disclosure of alternate embodiments are summarized in the following excerpt:¹¹⁶

“Equivalents” known at the time of filing of an original patent application can be disclosed. The terminology here deserves explanation. It is not typical to refer to an “equivalent” at the time of filing. “Equivalents” are the subject of infringement analysis long after filing. An equivalent at the time of filing would more likely be referred to as a “variation” or “alternative embodiment” of the invention, and that is what is meant herein by the term “equivalent” in the context of the time of filing, i.e., a variation or alternative to the invention that would later be asserted as an equivalent in an infringement context. By simply describing the equivalents as alternative embodiments in the original patent application, so long as the description conforms with the requirements of section 112 of Title 35 of the U.S.C., first paragraph, the equivalents can be claimed in the original application and perhaps in a later reissue patent application as well.

As a practical matter for the patent drafter, it is good practice to disclose alternative embodiments liberally. In so doing, the drafter is better able to generalize the various disclosed embodiments to arrive at a broad claim. Disclosure of alternative embodiments also affords the patent prosecutor flexibility to avoid prior art cited by the patent examiner. Finally, liberal disclosure is advantageous for defensive reasons. When the patent issues, the disclosure becomes prior art (as of its filing date) that can preclude others from patenting what is disclosed. On the other hand, failure to disclose an alternative embodiment, if it is separately patentable, leaves open the possibility that another will invent the alternative embodiment and patent it himself.

¹¹⁶ Taking a Step Beyond Maxwell to Tame the Doctrine of Equivalents, 11 Fordham Intell. Prop. Media & Ent. L.J. 155, 168-169 (Fall, 2000) (emphasis added) (footnote omitted).

7.3.12.3 Preferred Embodiments May Be Adequate, But Alternative Embodiments Provide Significant Additional Benefits

The benefits of alternative embodiments and the issue of preferred embodiments are illustrated by the Federal Circuit in Home Diagnostics.¹¹⁷

To overcome the presumption biasing claim construction in favor of the accustomed usage of a term in the relevant community at the relevant time, HDI must show a clear disavowal of such scope in the specification, prosecution history, or both. The district court erred by placing too much emphasis on the specification's discussion of the **preferred embodiments**, rather than the meaning of the claims themselves. Because the specification discussed only predetermined timing methods, the district court concluded incorrectly that the applicant had disavowed other ways to reach an endpoint ... Because the specification described **no other embodiments** in detail, the district court apparently interpreted the specification's silence regarding **alternative embodiments** as a disavowal. However, the applicant's choice to describe **only a single embodiment** does not mean that the patent clearly and unambiguously disavowed **other embodiments**. See Liebel-Flarsheim Co. v. Medrad, Inc., 358 F.3d 898, 907-08 (Fed. Cir. 2004).

Further, the court noted that:

The patent's preferred embodiment is just that - one way of using the invention. That disclosure alone does not clearly and unambiguously disavow other ways of computing the endpoint within the scope of the claim language.

Disclosure of preferred embodiments without alternative embodiments involves risks. See, e.g., Eolas Techs.¹¹⁸

Because this court "consistently declines to construe claims according to the preferred embodiment," this court agrees with the district court that Microsoft's proposed construction, limiting "executable application" to standalone programs, does not comport with the entire technological and temporal context for this term. N.

¹¹⁷ Home Diagnostics, Inc. v. LifeScan, Inc., 381 F.3d 1352, 1357, 72 U.S.P.Q.2d 1276 (Fed. Cir. 2004) (bold emphasis added).

¹¹⁸ Eolas Techs., Inc. v. Microsoft Corp., 399 F.3d 1325, 1337, 73 U.S.P.Q.2d 1782 (Fed. Cir. 2005).

Telecom Ltd. v. Samsung Elecs. Co., 215 F.3d 1281, 1293 (Fed. Cir. 2000).

7.3.12.4 The Disclosure Of Alternate Embodiments Facilitates Written Description And Places The Burden On The Examiner To Show Why “A Substitution ... Would Not Be Operable”

The Examiner violates the in banc law of the CCPA by misrepresenting the disclosed alternate embodiments. Alternate embodiments are condoned by the courts and necessitated for adequate patent protection (Section 7.3.12.2). In order for the Examiner to deprive the Appellant of his entitlement to the benefit of the disclosed alternate embodiments, he must show why “a substitution ... would not be operable”. This he has not done. Thus, for this additional reason – failure to consider the alternate embodiments, the § 112-1 rejections should be reversed.

In Byrne¹¹⁹, the CCPA commented in banc:

Recalling appellants’ explicit statement that the jet turbine of Figure 1 may be substituted for the rewind motor shown in Figure 2, it is apparent that the only material respect in which the embodiment of Figure 2 resulting from that modification fails to support count 4 is in the use of friction brakes instead of fluid brakes for the reel. The board found as a fact that appellants’ ‘description does not *explicitly* state anywhere that the water brake of the embodiment shown in Figs. 12 and 13 may be substituted for the friction brakes...in the combinations as shown in any of the other figures of the drawing.’ (Emphasis ours). While such finding is undeniably correct, **we think the board’s position puts entirely too restricted an interpretation on the language of the application,** and particularly on the aforementioned reference to figures 13 and 14 as illustrating an embodiment ‘in which we employ the principles of a water brake for the same purposes as set forth and described heretofore with respect to the embodiments of Figures 2 and 7.’ **No reason being apparent why a substitution of the water brake would not be operable, we think this statement constitutes a clear and unequivocal disclosure of that substitution to a person of ordinary skill [1] in the art.** The issue is not, as might be inferred from the board’s opinion, whether one following appellants’ specification would necessarily ‘produce’ or select the particular

¹¹⁹ Byrne v. Trifillis, 442 F.2d 1390, 170 USPQ 32, 34 (CCPA 1971) (emphasis added).

combination of the counts for his own use. **Rather, it is whether he would necessarily recognize that such a combination was disclosed as a construction which might be selected if desired.** The present application clearly discloses an alternative construction embodying the combination of count 4. Consequently, it supports that count and also the less limited combinations of counts 3 and 5.

Lest the Examiner attempt to erroneously distinguish Byrne because it is an interference, the CCPA in Squires¹²⁰ clarified this issue. The CCPA in Squires made clear that, for an applicant to have a right to copy a patent claim in an interference, he must have support for the full scope of the claim:

This conclusion rests on the recognition that the right to make a claim in a pending application, even for purposes of interference, depends, as it does with all pending claims, on compliance with the requirements of 35 USC 112, first paragraph. There is no other standard.

Squires.¹²¹ This statement by Judge Rich confirms the right to make a claim in an interference is subject to the same compliance with § 112-1 as any other pending claim. Establishing compliance with § 112-1 in an interference is the same as establishing § 112-1 in a non-interference proceeding.

7.3.12.5 The Federal Circuit Is Favorably Disposed To Alternate Embodiments For Written Description

The Federal Circuit confirms that the written description includes the disclosed alternative embodiments. The Federal Circuit stated in Serrano.¹²²

Disclosed structure includes **that which is described** in a patent specification, **including any alternative structures identified**

In particular, the application disclosed a discrete logic preferred embodiment and further disclosed:

¹²⁰ Squires v. Corbett, 560 F.2d 424, 194 USPQ 513, 520 (CCPA 1977).

¹²¹ Squires v. Corbett, 560 F.2d 424, 194 USPQ 513, 520 (CCPA 1977).

¹²² Serrano v. Telular Corp., 111 F3d 1578, 1582-1583, 42 USPQ2d 1538, 1542 (Fed. Cir. 1997) (emphasis added).

... "it should be recognized to those of ordinary skill in the art that a microprocessor-based system could also be used wherein the logical decisions are configured in software."

Serrano.¹²³ Based upon this simple statement, the court found that the specification sufficiently disclosed an alternative embodiment implemented using a microprocessor operating under software control. This is particularly compelling in the instant disclosure which discloses much more (e.g., it includes extensive software disclosures and extensive disclosures of alternate embodiments).

The Federal Circuit in Creo Prods. reinforced Serrano regarding alternative structures:¹²⁴

Proper application of § 112 § 6 generally reads the claim element to embrace distinct and **alternative described** structures for performing the claimed function. Specifically, disclosed structure includes that which is **described** in a patent specification, including any **alternative** structures identified.

See also Micro Chem., Inc. v. Great Plains Chem. Co., 194 F.3d 1250, 1258-59 (Fed. Cir. 1999); Ishida Co. v. Taylor, 221 F.3d 1310, 1316, 55 USPQ2d 1449, 1452-53 (Fed Cir. 2000) (quoting Serrano, 111 F.3d at 1583, 42 U.S.P.Q.2d at 1542); Versa Corp. v. AG-Bag Int'l Ltd., 392 F.3d 1325, 1329 (Fed Cir. 2004); In re Beigel, 7 Fed. Appx. 959, 963-64 (Fed. Cir. 2001) (quoting Serrano).

The Federal circuit in Micro Chemical favorably commented on multiple embodiments:¹²⁵

When **multiple embodiments** in the specification correspond to the claimed function, proper application of § 112, P6 generally reads the claim element to embrace **each of those embodiments**.

See also Versa Corp. v. Ag-Bag Int'l Ltd., 392 F.3d 1325, 1329 (Fed. Cir. 2004) (quoting Micro Chemical Inc.).

The Federal Circuit in Utter specifically contrasted two disclosures, one with multiple embodiments and the other without multiple embodiments.¹²⁶

¹²³ Serrano v. Telular Corp., 111 F.3d 1578, 1583, 42 USPQ2d 1538, 1542 (Fed. Cir. 1997) (quoting Patent No. 4,922,517, col. 10, lines 46-50).

¹²⁴ Creo Prods. v. Presstek, Inc., 305 F.3d 1337, 1346-1347, 64 USPQ2d 1385, 1391 (Fed. Cir. 2002) (emphasis added).

¹²⁵ Micro Chemical Inc. v. Great Plains Chemical Co., 194 F.3d 1250, 1258, 52 USPQ2d 1258 (Fed. Cir. 1999) (emphasis added).

Utter's application disclosed **two preferred embodiments**, an "internal pivot" and an "external pivot" configuration. Hiraga disclosed the internal pivot as the preferred embodiment, and did not specifically disclose the external pivot.

The Federal Circuit in DeMarini Sports favorably commented on multiple embodiments (configurations).¹²⁷

DeMarini notes that an integral relationship of the handle, the impact portion, and the tapered portion of the frame is only described as a preferred **embodiment** in the **written description** and that this **written description** indicates that **other configurations**, such as separate pieces, fall within the scope of the invention.

The Federal Circuit in Creo Products relates the patent description to multiple embodiments.¹²⁸

The specification of that patent **describes** the invention as it is applied to **two different embodiments**. The more conventional embodiment is an arrangement of the printing stations in a straight or "in-line" **configuration**. The **second embodiment** relies on a central impression cylinder that carries a sheet of recording material past each print station, eliminating the need for mechanical transfer of the medium to each print station.

This clearly shows that alternative embodiments are a well-accepted part of the written description.

7.3.12.6 The Examiner Misrepresents The Well Know Terms Of Art “Can Be” And “May Be” Related To Alternate Embodiments

The Examiner misrepresents the well know terms of art “can be” and “may be” related to alternate embodiments. This is in addition to such terms improperly establishing unclaimed subject matter (Section 7.3.5.1). In a teaching presentation, as in the instant application, it would be erroneous to teach an artisan that a function **must be** performed in a certain way when there are other ways to perform that function – it may be performed in that way or it may be performed in other disclosed ways.

¹²⁶ Utter v. Hiraga, 6 USPQ2d 1709, 1711 (Fed. Cir. 1988) (emphasis added).

¹²⁷ DeMarini Sports Inc. v. Worth Inc., 57 USPQ2d 1889, 1894 (Fed. Cir. 2001) (emphasis added).

¹²⁸ Creo Products Inc. v. Prestek Inc., 64 USPQ2d 1385, 1391 (Fed. Cir. 2002) (emphasis added).

The § 112-1 rejections complain about “can be” and “may be” type terminology in the disclosure but do not relate this objection to the claims. See prior Action at 23 and 574, respectively (emphasis added):

Numerous recitations of how the architecture “can be” configured appear throughout the specification (e.g., refer to pages, 133, 148, 156, 185, etc.).

In summary, the disclosed invention appears to be an image processing system, having specific “architecture” comprised of “modules” that can be “implemented” by “configuring” the modules using “software”.

What is most telling about the disclosed invention, especially with regard to the 35 DSC 112, first paragraph enablement requirement, is what is NOT disclosed.

For example, the specification is replete with the use of terms like “can be”, “may be used”, “could be used”, “such as”, “for example”, etc. (see the above quoted sections of the specification from pages 454, 466, and 494, for example) without any accompanying specifics as to how these various possibilities and permutations of possibilities can be implemented (either individually or as part of a larger, complete system).

However, this is art recognized terminology that is important to alternate embodiments in patent disclosures. For example, the Fant patent (Patent No. 4,835,532) recites “can be” and “may be” more than 100 times and the Sullivan patent (Patent No. 4,179,823) recites “can be” and “may be” more than 50 times. Thus, “can be” and “may be” type terminology is common and is art recognized. Thus, it is improper for the Examiner to complain about this terminology to misrepresent this terminology in order to attempt to support unsupportable § 112-1 rejections.

The CCPA in Sherwood established that “the touchstone [for § 112-1] is the content, not its form”.¹²⁹

Taking into account the expert opinions found in the two affidavits, it would appear that the detailed disclosure of the analog

¹²⁹ In Re Sherwood, 613 F.2d 809, 204 USPQ 537, 544-545 n.8 (CCPA 1980) (emphasis added).

method in combination with the suggestion that a digital method should be used might be more enlightening to one having ordinary skill in the art than the computer listing or flow chart required by the PTO. We view the PTO's requirement as quite formalistic in view of the verbal flow chart provided by appellant in the specification. In any event, the touchstone is the content, not its form.

The Federal Circuit in Union Oil established that § 112-1 can even be satisfied with a description in terms of ranges.¹³⁰

Drs. Jessup and Croudace described their invention in terms of ranges. That form of description does not offend § 112, ¶ 1. In fact, this invention lends itself to description in terms of ranges

In Liebel-Flarsheim and in many predecessor Federal Circuit cases, the Federal Circuit rejected the contention that even for a disclosure having only a “single embodiment”, the claims must be construed as being limited to that embodiment.¹³¹

[T]his court has expressly rejected the contention that if a patent describes only a single embodiment, the claims of the patent must be construed as being limited to that embodiment. See ACTV, Inc. v. Walt Disney Co., 346 F.3d 1082, 1091 (Fed. Cir. 2003); Apex Inc. v. Raritan Computer, Inc., 325 F.3d 1364, 1377 (Fed. Cir. 2003); Altiris, Inc. v. Symantec Corp., 318 F.3d 1363, 1373 (Fed. Cir. 2003); Tex. Digital Sys., Inc. v. Telegenix, Inc., 308 F.3d 1193, 1204-05 (Fed. Cir. 2002); Teleflex, Inc. v. Ficosa N. Am. Corp., 299 F.3d 1313, 1327 (Fed. Cir. 2002); SRI Int'l v. Matsushita Elec. Corp. of Am., 775 F.2d 1107, 1121 n.14 (Fed. Cir. 1985) (en banc).

If “must be” is not the standard, then terminology such as “can be” and “may be” are the standard.

Clearly, terminology such as “can be” and “may be” that are recited in the instant disclosure are appropriate. Thus, because the Examiner misconstrued the disclosure, for this reason alone the § 112-1 rejections should be reversed.

The Federal Circuit in Liebel-Flarsheim implicitly condones terminology in the disclosure such as “can be” and “may be”.¹³²

¹³⁰ Union Oil Co. of California v. Atlantic Richfield, 208 F.3d 989, 54 USPQ2d 1227, 1233 (Fed. Cir. 2000) (emphasis added).

¹³¹ Liebel-Flarsheim Co. v. Medrad, Inc., 358 F.3d 898, 906 (Fed. Cir., 2004) (emphasis added).

¹³² Liebel-Flarsheim Co. v. Medrad, Inc., 358 F.3d 898, 906 (Fed. Cir., 2004).

Even when the specification describes only a single embodiment, the claims of the patent will not be read restrictively unless the patentee has demonstrated a clear intention to limit the claim scope using “words or expressions of manifest exclusion or restriction.” Teleflex, Inc. v. Ficosa N. Am. Corp., 299 F.3d 1313, 1327 (Fed. Cir. 2002).

Because the instant disclosure demonstrates just the opposite with terminology such as “can be” and “may be”, it gains the benefit of not being read restrictively. Thus, it is improper for the Examiner to criticize terminology in the disclosure such as “can be” and “may be”.

In view of the above, the Examiner’s objections to “can be” and “may be” type terminology in the disclosure infers that he has not properly considered the disclosure and the art recognized meanings of the terminology in the disclosure.

7.3.13 The Disclosed “Configurations” Are In Effect Embodiments And Are Condoned By The Federal Circuit

The Federal Circuit in Utter characterized a “configuration” as related to an “embodiment”:¹³³

Utter’s application disclosed two preferred **embodiments**, an “internal pivot” and an “external pivot” **configuration**.

The Federal Circuit in DeMarini Sports equates a “configuration” and an “embodiment”:¹³⁴

DeMarini notes that an integral relationship of the handle, the impact portion, and the tapered portion of the frame is only described as a preferred **embodiment** in the written description and that this written description indicates that other **configurations**, such as separate pieces, fall within the scope of the invention.

The Federal Circuit in Transmatic characterized a “configuration” as related to an “embodiment”:¹³⁵

While the preferred **embodiment** disclosed in the patent has this **configuration**, a patent claim is not necessarily limited to a preferred

¹³³ Utter v. Hiraga, 6 USPQ2d 1709, 1711 (Fed. Cir. 1988) (emphasis added).

¹³⁴ DeMarini Sports Inc. v. Worth Inc., 57 USPQ2d 1889, 1894 (Fed. Cir. 2001) (emphasis added).

¹³⁵ Transmatic Inc. v. Gulton Industries Inc., 35 USPQ2d 1035, 1040-41 (Fed. Cir. 1995) (emphasis added).

embodiment disclosed in the patent. . . . ("This court has cautioned against limiting the claimed invention to preferred embodiments or specific examples in the specification.")

The Federal Circuit in SciMed Life Systems characterized a "configuration" as related to an "embodiment".¹³⁶

The parties also agree that the accused ACS devices employ only the dual lumen configuration and that the preferred embodiment described in the SciMed patents employs the coaxial lumen configuration.

The Federal Circuit in Prima Tek II LLC equates a "configuration" and an "embodiment".¹³⁷

Similarly, the mere fact that the patent drawings depict a particular embodiment of the patent does not operate to limit the claims to that specific configuration.

The Federal Circuit in Creo Products characterized a "configuration" as related to an "embodiment".¹³⁸

The specification of that [‘368] patent describes the invention as it is applied to two different embodiments. The more conventional embodiment is an arrangement of the printing stations in a straight or "in-line" configuration. The second embodiment relies on a central impression cylinder that carries a sheet of recording material past each print station, eliminating the need for mechanical transfer of the medium to each print station.

The Federal Circuit in Anchor Wall Systems equates a "configuration" and an "embodiment".¹³⁹

Similarly, the mere fact that the patent drawings depict a particular embodiment of the patent does not operate to limit the claims to that specific configuration.

The Federal Circuit in TI Group Automotive Systems equates a "configuration" and an "embodiment".¹⁴⁰

¹³⁶ SciMed Life Systems v. Advanced Cardiovascular Systems, 58 USPQ2d 1059, 1061 (Fed. Cir. 2001) (emphasis added).

¹³⁷ Prima Tek II LLC v. Polypap S.A.R.L., 65 USPQ2d 1818, 1821 (Fed. Cir. 2003) (emphasis added).

¹³⁸ Creo Products Inc. v. Prestek Inc., 64 USPQ2d 1385, 1391 (Fed. Cir. 2002) (emphasis added).

¹³⁹ Anchor Wall Systems Inc. v. Rockwood Retaining Walls Inc., 67 USPQ2d 1865, 1870 (Fed. Cir. 2003) (emphasis added).

[W]e have held that "the mere fact that the patent drawings depict a particular embodiment of the patent does not operate to limit the claims to that specific configuration."

In view of the above, the disclosure of configurations constitutes a disclosure of embodiments.

7.3.14 Ex Parte Richards Provides Guidance From The Board Regarding The Disclosure Of "Interconnections"

The Examiner misrepresents the disclosure of interconnections and interrelations. However, the disclosure has extensive interconnections (Section 7.3.15). Further, the Examiner has disregarded the law on interconnections (discussed below and in Section 7.3.15).

The Board in Richards¹⁴¹ found that even an apparently sparse disclosure of "standard components" and the failure of the Examiner to establish a prima facie case warranted reversal of an enablement rejection. These issues are similar to the issues in the instant appeal – the disclosure of interconnections and the failure of the Examiner to establish a prima facie case. While the appellant in Richards merely relies on parts of merely three pages of disclosure for an example, the present disclosure, in significant contrast thereto, has hundreds of pages of relevant disclosure including more than two hundred pages of detailed disclosure of an actually reduced-to-practice "experimental system" embodiment disclosing extensive interconnections (e.g.; Section 5.7). Furthermore, the appellant in Richards failed to argue a prima facie case issue, yet the Board therein still held that "the examiner has not met his burden" regarding the prima facie case (Richards at 4). In significant contrast thereto, the present Appellant argued at length the failure of the Examiner to establish a prima facie case (e.g.; Sections 7.2.1 and 7.3.6 herein). See also Richards at 3-4:

OPINION ...

¹⁴⁰ TI Group Automotive Systems (North America) Inc. v. VDO North America LLC, 71 USPQ2d 1328, 1336 (Fed. Cir. 2004) (emphasis added).

¹⁴¹ Ex parte Richards, Appeal No. 1999-1847 (Bd. Pat. App. & Int.) (unpublished opinion), at <http://www.uspto.gov/web/offices/dcom/bpai/decisions/fd991847.pdf>. See also U.S. Patent No. 6,382,101 (issued May 7, 2002 to Richards).

The examiner maintains that the structural connections, circuitry and cooperation are not sufficiently disclosed.... We find that the examiner has not attempted to establish why the supporting specification in combination with the relevant prior art fails to enable the claims which is the examiner's initial burden. **In re Marzocchi**, 439 F.2d 220, 223, 169 USPQ 367, 369 (CCPA 1971). From our review of the examiner[']s rejection, the examiner maintains that the programming and specific interconnection of the functional units "must" be disclosed in the specification.... We disagree with the examiner. The examiner provides no reasoned analysis of why these would be needed or required.... The examiner carries the initial burden to establish a case. Here, the examiner has not met his burden, and we will not sustain the rejection of claims 7-12 under 35 U.S.C. § 112, first paragraph.

However, appellant has not argued that the examiner failed to establish a *prima facie* case, but merely that the specification is enabling to those skilled in the art. ...

It is worth repeating (Richards at 3-4):

From our review of the examiner[']s rejection, the examiner maintains that the programming and specific interconnection of the functional units "must" be disclosed in the specification.... We disagree with the examiner. The examiner provides no reasoned analysis of why these would be needed or required.

If "the programming and specific interconnection of the functional units" need not be disclosed in Richards, then it is inconsistent to maintain the § 112-1 rejections in the instant application which has extensive disclosure of "programming and specific interconnection of the functional units". As in Richards, the instant claimed invention makes use of such "standard components which are connected by standard electrical connections".

In Richards, the Board found that "a basic example of the operation of the invention" on parts of three pages of the specification was sufficient (Richards at 4):

However, appellant has not argued that the examiner failed to establish a *prima facie* case, but merely that the specification is enabling to those skilled in the art. ... Furthermore, appellant relies on a basic example of the operation of the invention at pages 5 and 6 of the brief. Appellant cites to only specific portions of pages 5, 6, and 7 of the specification to support the example.

However, the Examiner in the instant application has not adequately considered the extensive instant disclosure; e.g., more than **30 figures** (e.g., Figs. 6A-6AH) and more than **200 pages** of very detailed written disclosure **specifically directed to the disclosed actually reduced-to-practice “experimental system” embodiment**. See Section 5.7. See also Sections 7.3.10, 7.3.16, 7.5.8, and 7.5.10.

The instant disclosure; e.g., the actually reduced-to-practice “experimental system” embodiment; includes “standard components which are connected by standard electrical connections” are consistent with the Board’s finding in Richards that “standard components ... connected by standard electrical connections” are sufficient (Richards at 4):

Appellant argues that the devices in the specification and claims are standard components which are connected by standard electrical connections and that one skilled in the art would be able to make and use the invention without undue experimentation. ... We agree with appellant.

In view of the Board’s holding in Richards, the instant disclosure (including the disclosed actually reduced-to-practice “experimental system” embodiment) having significantly greater disclosure than in Richards must certainly be sufficient.

In Richards, the Board reached its decision regarding the sufficiency of Richards’ disclosure by noting that the Wuhrl reference “contains a similar level of description as the instant description with respect to the interconnection of standard elements and does not provide any of the specifics for programming these standard functional units” (Richards at 4-5):

Specifically, the prior art to Wuhrl applied against the claims is indicative of the level of skill in the relevant art. Wuhrl contains a similar level of description as the instant description with respect to the interconnection of standard elements and does not provide any of the specifics for programming these standard functional units. Similarly, we find that from the basic functional description of these standard components, it would have been obvious to one of ordinary skill in the art at the time of the invention to program and interface these components together to make and use the system to aid in the selection of ink fountains for adjustment by an operator.

Just as in Richards, the applied references in the instant application have much less disclosure than the instant application but are still presumed to be sufficiently disclosed.

In Richards, the Board commented that it would have been obvious for an artisan to program and interface the standard components “from the basic functional description of these standard components” (Richards at 5 (emphasis added)):

Similarly, we find that from the basic functional description of these standard components, it would have been obvious to one of ordinary skill in the art at the time of the invention to program and interface these components together to make and use the system to aid in the selection of ink fountains for adjustment by an operator.

However, the instant application discloses far more than a “basic functional description of ... standard components”. It discloses commercially available operating system software and source code for custom computer programs (discussed herein) and it discloses commercially available computer interface boards (e.g., two Compupro Interfacer-II board and one Compupro System Support board). See Spec. at 297 (emphasis added):

The computer is implemented with various S-100 boards manufactured by CompuPro including the 8085-8088 CPU board, RAM 16 and RAM 17 memory boards, a System Support board, and a pair of Interfacer 2 boards. One Interfacer 2 board is used to interface to the terminal and printers. The other Interfacer 2 board provides the 3-channel parallel interface to the control logic. These boards are described in detail in the referenced manuals.

And this disclosure is in the highly predictable electronics art where one skilled in the art would know how to program and interface standard components even if not expressly disclosed in the instant application. This notwithstanding the fact that the instant application has extensive programming and interfacing disclosure.

7.3.15 The Examiner Misrepresents The Disclosure Of Interconnections and Interrelations

7.3.15.1 The Application Has Many Disclosures Of Software Interconnections and Interrelations

The Examiner objects in general to the disclosure of “interconnections and interrelations” but he fails to properly consider the extensive disclosure of computer and programming “interconnections and interrelations” (e.g., prior Action at 54 (emphasis added)):

The specification never once describes the integration of the individual disclosed elements to perform the overall claimed functions. That is, the specification never once describes any interconnections or interrelations between the individual functional elements, including any timing between them, any control between them, or any input-output characteristics between them in such a manner that would enable one skilled in the art to make and use the later claimed inventions without undue or unreasonable experimentation.

See also Section 7.3.15.6. It is not clear if the Examiner is alleging that the disclosed computer, or memory, or computer program have problems with “interconnections and interrelations”. Programs are sequences of computer instructions, computers and memories were well known in the art, commercially available computer and memory products were used in the disclosed actually reduced-to-practice “experimental system”, and custom memories are disclosed in detailed schematic and textual form with numerous interconnections. And a computer patent disclosure need only teach the functions of the software, despite the fact that the instant application has extensive disclosure of both software and hardware:¹⁴²

The claimed invention subject matter need not be described literally, i.e., using the same terms, in order for the disclosure to satisfy the description requirement. Software aspects of inventions may be described functionally. See *Robotic Vision Sys. v. View Eng'g, Inc.*, 112 F.3d 1163, 1166, 42 USPQ2d 1619, 1622-23 (Fed. Cir. 1997); *Fonar Corp. v. General Electric Co.*, 107 F.3d 1543, 1549, 41 USPQ2d 1801, 1805 (Fed. Cir. 1997); *In re Hayes Microcomputer Prods., Inc.*, 982 F.2d 1527, 1537-38, 25 USPQ2d 1241, 1248-49 (Fed. Cir. 1992).

The instant application provides extensive disclosure of computer programs. These include the disclosure and incorporation-by-reference of commercially available software (e.g., the CP/M operating system (e.g.; Spec. at 33 and 297-299)), source code listings of custom software programs for the “experimental system” (e.g.; Spec. at 247-292, and 544-574), and verbal software disclosures (e.g.; Spec. at 66-154, 378-406, and 435-574). This despite the fact that this extensive computer software disclosure is not necessary -- the CCPA in Sherwood established that “the touchstone [for § 112-1] is

¹⁴² MPEP at § 2106, in discussing compliance with the written description requirement at B.1. (pp. 2100-20; Revision 2, May 2004).

the content, not the form”, and that § 112-1 can even be satisfied with a “verbal flow chart” (e.g.; Section 7.5.6.1).¹⁴³

As an example of the instant computer disclosure, a commercially available computer and commercially available computer memories were used in the disclosed actually reduced-to-practice “experimental system” and documentation on these commercially available products was filed by the Appellant in the PTO in the Disclosure Document program and incorporated-by-reference into the instant application by reference (Spec. at 575-576). However, this computer and computer memory disclosures were not properly considered by the Examiner. Therefore, it is not surprising that the Examiner did not find computer and computer memory interconnections and interrelations, the Examiner disregarded the disclosed computer and memory interconnections and interrelations. This is in effect a computer system invention and that many of the functions are performed with software by the computer.

As an example of the instant software disclosure, commercially available “operating system” software (CP/M (e.g.; Spec. at 33 and 297-299)) and a Basic compiler (e.g.; Spec. at 133, 247, 248, and 299) were used in the disclosed actually reduced-to-practice “experimental system” and documentation on these commercially available software products and were incorporated-by-reference into the instant application by reference (Spec. at 298-299). However, these software disclosures were not properly considered by the Examiner. Therefore, it is not surprising that the Examiner did not find software interconnections and interrelations, the Examiner disregarded the disclosed software interconnections and interrelations. Again, this is in effect a computer system invention and that many of the functions are performed with software by the computer. And the commercially available CP/M operating system program manages the computer operations, interconnects the different computer peripherals, the different applications programs, and much much more. See the documents that describe this CP/M operating system program that are incorporated-by-reference (Spec. at 298-299).

As a further example, a program is coded in sequence and the computer executes programs in sequence. Thus, adjacencies between instructions constitute “interconnections and interrelations” and the progression of program execution by the computer. Further, computer programs also contain non-sequential instructions: e.g.; branch instructions, jump instructions, subroutine call instructions, and return

¹⁴³ In Re Sherwood, 613 F.2d 809, 204 USPQ 537, 544-545 n.8 (CCPA 1980).

from subroutine instructions. These non-sequential instructions are also well known in the art. Branch instructions, jump instructions, and subroutine call instructions identify the destination: e.g., by an address or a mnemonic embedded in the instruction. Return instructions return to the program location from which they came. Such computer instructions were well known since the 1960s and before, included in the disclosed CP/M operating system software, included in the disclosed applications (Basic) software, and clearly provide “interconnections and interrelations”.

The Examiner misrepresented the significant computer program related disclosures in the instant application. The original Summary of the Invention in the instant application identifies “software” improvements in the instant application and the instant application has significant software-related disclosures:¹⁴⁴

SUMMARY OF THE INVENTION

The present invention is generally directed to improved processing systems and, in particular, provides improvements in memory, processor, software, and control architectures and in software and hardware designs. A system architecture is provided that provides flexibility, performance, and efficiency. A geometric processor is provided that implements rotation, translation, expansion, compression, warping, 3D-perspective, vector generation, and other features in a high performance and efficient manner, such as by using a window implementation and by providing the flexibility of software control. A spatial processor is provided that provides smoothing, anti-aliasing, and other features. Memory architectures and designs are provided that increase performance and efficiency, including a memory map and a buffer memory. Programs are provided that enhance flexibility and capability, yet preserve the high performance of the hardware. For example, efficient geometric initial condition generation and time domain interpolation enhance performance. Many other novel and valuable features are disclosed.

In view of the above, it is not clear why the Examiner would even bring up “interconnections and interrelations” in this disclosed programming environment. He uses the term “interconnections and interrelations” indiscriminately and without explaining its meaning or relevance in view of the computer

¹⁴⁴ Spec. at 4 (heading emphasis in original, all other emphasis added).

and programming nature of the disclosure and in view of the extensive computer and software “interconnections and interrelations” in the disclosure.

7.3.15.2 The Application Has Many Verbal Disclosures Of Interconnections and Interrelations

The application has many verbal disclosures of interconnections and interrelations. The verbal descriptions of the elements and functions in the disclosure also describe the interconnections and interrelations therebetween. For example, the single “Overlays” section of the disclosure (Spec. at 386-406) teaches interconnections and interrelations, many of which are actual “working examples” of the interconnections and interrelations (e.g.; see the LD.ASC source code menu (Spec. at 548)). Further, navigational and sensor elements are taught operating in this same “Overlays” section in the context of overlaying navigation and sensor information (Spec. at 387):

Overlays can include pictorial features, annotation symbols, imaginary pathways for map displays, and other such overlays. In a military application; overlays can be related to fire control, bombing, sensors, and navigation. Navigation information can include GPS, inertial, celestial, radar, Tercom, dead-reckoning, and other navigation information. Sensor information can include radar, infra-red, video, sonar, and other sensor information.

Certainly, the overlaying of different image features on a background image cannot lack interconnections and interrelations therebetween, to the extent that some form of interconnections and interrelations are desired, the overlay process interconnects the image features therebetween.

The software embodiment provides interconnections and interrelations through the software (e.g.; Section 7.3.15). However, the Examiner misrepresented this software embodiment, has not provided the required “substantial evidence” relative thereto, and has not established the required prima facie case relative thereto. Instead, the Examiner makes generalized erroneous conclusory statements about interconnections and interrelations.

The Examiner does not clarify whether he is seeking hardwired interconnections, program interconnections, or what; only that he cannot find interconnections or interrelations. However, the Examiner has disregarded the disclosed “working examples”; e.g., the computer loading and overlaying

of the image information into the image memory, such as with the LD.ASC computer program and with the “Image Loading” computer operations (Spec. at 155-160, 246, and 547-560). The disclosure of the computer loading image information into the image memory and the computer overlaying image information onto the image information stored in the image memory represents significant interconnections and interrelations and it is disclosed in detail including the actual schematic diagrams for the image memory, the actual computer source code for the LD.ASC computer program, and the video tapes of the display of the overlaid images. This is further shown in block diagram form (e.g.; Figs. 1A, 1P, and 6A) and in verbal description form (Spec. at 155-160, 246, and 386-406). The CCPA in Sherwood established that “the touchstone [for § 112-1] is the content, not the form”, and that § 112-1 can be satisfied with a “verbal flow chart” (Section 7.5.6.1).¹⁴⁵ However, the Examiner has misrepresented the fact that computer programs are expressly “interconnected and interrelated” and that computers, computer memories, and computer programs stored in the memories and executed in the computers are all expressly “interconnected and interrelated”.

Regarding the hardware “interconnections and interrelations”, the Examiner misrepresents the detailed top-down disclosure of block diagrams and schematic diagrams and the detailed verbal descriptions thereof in the disclosure.

In the actually reduced-to-practice “experimental system” the image memory provides an interface between the computer and other system elements (e.g., the display) and image information is taught with actual reduced-to-practice source code as being loaded from the computer into image memory and as being scanned out from the image memory under program control for display. Pictorial images are loaded as discussed in the section entitled “Image Loading” (Spec. at 246) and generated images (e.g., graphic images) are generated and overlaid with the LD.ASC program (Spec. at 155-160 and 547-560). However, the Examiner has not properly considered such interconnections and interrelations. The claimed interconnections and interrelations are disclosed, many of which with “working examples” and many of which as computer and software interconnections.

Thus, the Examiner’s broad conclusory statement is erroneous (e.g., prior Action at 54 (emphasis added)):

¹⁴⁵ In Re Sherwood, 613 F.2d 809, 204 USPQ 537, 544-545 n.8 (CCPA 1980).

The specification never once describes the integration of the individual disclosed elements to perform the overall claimed functions. That is, the specification never once describes any interconnections or interrelations between the individual functional elements, including any timing between them, any control between them, or any input-output characteristics between them in such a manner that would enable one skilled in the art to make and use the later claimed inventions without undue or unreasonable experimentation.

7.3.15.3 The Examiner Misrepresents In Re Ruschig

The Examiner misrepresents Ruschig (instant Action at 12-14). The CCPA in Ruschig¹⁴⁶ used the term "blaze mark" to mean the name of a "tree" to locate it in the "forest" (in the disclosure). Clearly, the instant disclosure satisfies the CCPA's requirement for a "blaze mark" that names the tree.

The CCPA's use of the term "blaze mark" relates to the disclosure of the name of a tree (Ruschig at 122 and 123; respectively (emphasis added)):

We are looking for blaze marks which single out particular trees....

Finally, appellants refer to two tables There is no N'-n-propyl compound among them

It is equally easy to imagine that the compound of claim 13 might have been named in the specification....

Not having been specifically named or mentioned in any manner, one is left to selection from the myriads of possibilities encompassed by the broad disclosure

Because there is no question that the names of the claimed elements, acts, and functions are adequately disclosed in the instant application; the requirements of the CCPA are satisfied for written description.

In Union Oil,¹⁴⁷ the Federal Circuit reinforced the Ruschig approach with a tabular analysis for written description -- a table showing the names of the elements recited in the claims and a cite to the

¹⁴⁶ In re Ruschig, 379 F.2d 990, 154 USPQ 118 (CCPA 1967).

¹⁴⁷ Union Oil Co. of California v. Atlantic Richfield, 208 F.3d 989, 54 USPQ2d 1227 (Fed. Cir. 2000).

disclosure for the locations of the names of the elements. The Federal Circuit even selected a claim element from an original claim, which was not even disclosed in the patent, for a holding of adequate written description. Hence, in view of Ruschig and Union Oil, written description is satisfied by disclosing the names of the claimed elements or acts in the original disclosure. See, e.g.; Tables 5.1, 5.2, and 5.3 (Section 5 herein).

Particularly noteworthy is the fact that Ruschig and Union Oil are in the unpredictable chemical art while the instant application is in the highly predictable electrical art. Further, the instant case is in the computer art and many of the claimed functions are performed with computer software (Section 7.3.11). Still further, the Examiner does not properly consider the disclosed self contained embodiment (Section 5.6) or the disclosed actually reduced-to-practice "experimental system" (Section 5.7). For these reasons alone, the § 112-1 rejections should be reversed.

The Examiner conceded that the instant disclosure has the claimed trees – the functions and elements (instant Action at 7-8, 10, 16, and 20-22; respectively) (bold underline emphasis added):

The specification describes numerous input devices, processing capabilities, and output devices and described as "capabilities", or "options" of the aforementioned architectures.

Some of the optional inputs include (spec, page 25):

- Winchester disk
- VAX bus interface
- Multi-bus interface
- Video disk
- Video tape
- Vidicon
- Orthocon
- Infrared
- Radar
- Sonar

Some of the optional geometric processing capabilities include (spec, page 26):

- Rotation
- Compression
- Expansion
- Translation
- 30-Perspective
- Warping

Some of the optional spatial processing capabilities include (spec, page 29):

- Pipeline processing
- Progressive Compression
- Pre-filtering
- Post-filtering

Some of the optional output devices include (spec, page 30):

- Winchester Disk
- Pattern Recognition System
- CRT Monitor
- Video Keyer
- Video Cassette
- Artificial Intelligence System

These (and other) hardware and/or processing capabilities and options are described in brief snippets throughout the specification.

These and the many other miscellaneous image processing operations are described throughout the specification as possibilities, or capabilities of the overall system rather than as coherent embodiments and cohesive descriptions that tie them together; especially in a manner that describes the claimed inventions.

- **Given the numerous disclosed architectures, input, processing and output options of each architecture, and the miscellaneous disclosed image processing operations**, the examiner is looking for guides in the specification that tie together a disclosed architectures and/or a selected set of the disclosed options and/or a selected one or more of the disclosed image processing operations

It is true that the terms are described, individually, as "capabilities", or "options" within separate, proposed applications. However, there is no description of them being performed together in the manner claimed, and there is no description of which hardware configuration and selected options therein performs the acts. Again, the examiner has read the originally filed disclosure looking for coherent embodiments, or any type of guidance or cohesion that (while not exactly) at least reasonably convey to one skilled in the art that the application [sic] had possession of the now claimed inventions. In this

case, the examiner cannot find any cohesive link between the claimed elements.

One might speculate as to whether the generalized hardware configurations are the guides that lead a path (i.e., provide the link) between the disparately disclosed image processing operations. After all, several generalized hardware configurations along with numerous options pertaining to many of the claim elements are disclosed. However, there is nothing in the description of the image processing operations (e.g., see the specification citations above) that point to any of the disclosed architectures or hardware options therein. Further, there are no references in the architecture or hardware configuration descriptions that point to any of the miscellaneous disclosed image processing operations (e.g., the specification citations above). There are no links between the two. Again, the specification discloses various architectures, various input, processing and output options, and numerous miscellaneous image processing operations scattered throughout. There are no cohesive suggestions or guides that link them in a manner that leads one to the claimed invention. The hardware configurations are not the glue that binds the miscellaneous image processing operations together to form embodiments commensurate with the claims. In order to do this, the claim would be needed as THE guide. However, without foreknowledge of the claim, the examiner does not believe anything in the specification would guide one to the claimed invention. Given the original disclosure, the examiner cannot find evidence (via. guides) of possession of the now claimed invention.

Again, it is agreed that numerous hardware configurations and countless options therein are disclosed. *However, a disclosure of numerous configurations and options from which to select does not constitute a disclosure of a particular selection. The selection was made in effect when the claim was drafted.*

That satisfies the requirements of the CCPA (e.g., Ruschig) and the Federal Circuit (e.g., Union Oil).

**7.3.15.4 The Examiner's Erroneous Conclusory Statements Regarding Unidentified
"Interconnections And Interrelations" Are Wrong As A Matter Of Fact And As A
Matter Of CCPA Law**

The Examiner's erroneous conclusory statements regarding "interconnections and interrelations" are wrong as a matter of fact and as a matter of CCPA law. The facts establish that the interconnections and interrelations are disclosed in great detail. But the law establishes that such a disclosure is not even necessary when, as here, there is no apparent reason why the combination would not be operable and when an artisan would understand the interconnections and interrelations *infra*. This is particularly so with software and computer hardware interconnections and interrelations (e.g., Sections 7.3.11, 7.3.15.1, and 7.3.15.6).

Conclusory statements regarding allegedly missing "interconnections and interrelations" are no substitute for the specifics that are necessary to provide the "substantial evidence" that is required to support the rejections. In contrast thereto, Tables 5.2.1 *et seq* illustrate the described interconnections in the Fig. 1A self-contained embodiment (Sections 5.2 and 5.6).

Despite the fact that the instant disclosure provides extensive relevant interconnections and interrelations, including both hardware and software interconnections and interrelations, such a disclosure is not necessary. The CCPA long ago established that disclosure of the functions that an artisan might reasonably combine is sufficient in the absence of an apparent reason "why a substitution ... would not be operable". See *Byrne*.¹⁴⁸

Recalling appellants' explicit statement that the jet turbine of Figure 1 may be substituted for the rewind motor shown in Figure 2, it is apparent that the only material respect in which the embodiment of Figure 2 resulting from that modification fails to support count 4 is in the use of friction brakes instead of fluid brakes for the reel. The board found as a fact that appellants' "description does not *explicitly* state anywhere that the water brake of the embodiment shown in Figs. 12 and 13 may be substituted for the friction brakes * * * in the combinations as shown in any of the other figures of the drawing." (Emphasis ours). While such finding is undeniably correct, **we think the board's position puts entirely too restricted an interpretation on**

¹⁴⁸ *Byrne v. Trifillis*, 442 F.2d 1390, 170 USPQ 32, 34 (CCPA 1971) (emphasis added).

the language of the application, and particularly on the aforementioned reference to figures 13 and 14 as illustrating an embodiment “in which we employ the principles of a water brake for the same purposes as set forth and described heretofore with respect to the embodiments of Figures 2 and 7.” No reason being apparent why a substitution of the water brake would not be operable, we think this statement constitutes a clear and unequivocal disclosure of that substitution to a person of ordinary skill [1] in the art. The issue is not, as might be inferred from the board’s opinion, whether one following appellants’ specification would necessarily “produce” or select the particular combination of the counts for his own use. Rather, it is whether he would necessarily recognize that such a combination was disclosed as a construction which might be selected if desired The present application clearly discloses an alternative construction embodying the combination of count 4. Consequently, it supports that count and also the less limited combinations of counts 3 and 5.

The Board in Nelson followed the law articulated in Byrne.¹⁴⁹

Bowler argues ... that there is no specific teaching in Nelson to modify Example 5 to obtain the compounds of the counts. Thus, Bowler urges that although Nelson discloses in the list of substituents the required meta substituents of the counts, Nelson also disclosed the ortho and para substituents, among others, and there is no indication of preference for the substituents of the counts and therefore there is no reason to single out the required meta substituents. In our view, however, the issue is not whether one following the Nelson disclosure would necessarily produce the compounds or prefer the particular disclosed substituents (m-chloro or m-trifluoromethyl) required to prepare the compounds of the counts; rather, it is whether he would necessarily recognize that such a combination was disclosed as a construction which might be selected if desired *Byrne v. Trifillis*, 442 F.2d 1390, 170 USPQ 32, 34 (CCPA 1971). We believe that one following the Nelson disclosure would necessarily recognize that the compounds of the counts were disclosed as a combination that might be selected if desired, i.e., the message would be conveyed that Nelson invented the compounds of the counts.

Just as the Examiner is wrong as a matter of fact with his conclusory comments on the lack of interconnections and interrelations,¹⁵⁰ as with Byrne the Examiner is also wrong as a matter of law with

¹⁴⁹ Nelson v. Bowler, 1 USPQ2d 2076 at 2079 (Bd. Pat. App. & Int. 1986) (emphasis added).

his conclusory comments on the lack of interconnections and interrelations in view of the clear operability.

7.3.15.5 The Disclosure Provides Extensive Legal “Examples” Of Interconnections

The disclosure is an integrated presentation of features that operate together and are interconnected together (e.g.; Sections 5.6, 5.7, and 7.3.15). For example: Fig. 1A is a top level block diagram with many of the components of the system disclosed and interconnected all-together; Figs. 1B, 1D-1G, 5A, 5D, and 6E are second level block diagrams detailing blocks in Fig. 1A; Figs. 1C, 1H-1J, 1L, 1P, 2M, 6A, 8, and 9 are simpler embodiment block diagrams illustrating subsets of and alternatives to Fig. 1A that can be used for different embodiments;¹⁵¹ and Figs. 6B-6D and 6F-6AH are schematic diagrams further detailing blocks in Fig. 1A. These figures present a significant amount of interconnections in between elements.

The computer listings (Spec. at 248-292, 544-574) are detailed source code Basic compiler listings. They are actually reduced-to-practice computer programs and they constitute “working examples”. They are executed by the supervisory processor in the disclosed actually reduced-to-practice “experimental system” and they operate with the other software (e.g., compiled Basic and C/PM operating system programs) and hardware in the disclosed actually reduced-to-practice “experimental system”. Computer instructions in computer programs are expressly interconnected therebetween (Section 7.3.15) and are expressly interconnected with the computer system by which they are being executed.

The “Overlays” section, for example, (Spec. at 386-406) further combines and interconnects claim limitations, the LD.ASC computer program (addressed therein) still further combines and

¹⁵⁰ The instant disclosure provides extensive relevant interconnections and interrelations and combinations including both hardware and software interconnections and interrelations and combinations.

¹⁵¹ These include the block diagram (Fig. 1H) directed to the actually reduced-to-practice “experimental system” (“Fig 1H is a block diagram of an alternate configuration of the system of the present invention as implemented in an experimental system” (Spec. at 5)).

interconnects image processing operations, and the “image memory” (addressed therein and in Section 7.3.15.8 herein) yet further combines and interconnects the claim limitations.

7.3.15.6 The Examiner Misrepresents The Interconnections And Interrelations Of Computer Programs

The Examiner misrepresents the disclosure of interconnections and interrelations of computer programs. Computer programs have express interconnections and interrelations (Section 7.3.15).

For example, the LD.ASC computer program implements actually reduced-to-practice features; e.g.; generating graphics images and processed images and overlaying, combining, and occulting of image features in image memory. The “Overlays” section further expands on this LD.ASC program by further disclosing overlays of image information (Spec. at 386-406). For example, the “Overlay” section teaches overlaying of “combinations of processed images and graphic polygons” on a background image (e.g.; Spec. at 386):

Overlays

Overlays can include combinations of processed images and graphic polygons. For example, in a map display; processed images can be used for background terrain and for certain objects overlaid thereon and graphic images can be used for symbols and polygon images overlaid thereon.

Then for twenty pages various combinations of overlays are discussed. The “Overlays” section expressly addresses overlaying of the following type images – irregular cropped, perspective, warped, graphics, video, textured, and background images and expressly addresses rotation and translation for the overlay images. The CCPA in Sherwood established that “the touchstone [for § 112-1] is the content, not the form”, and that § 112-1 can even be satisfied with a “verbal flow chart” (e.g.; Section 7.5.6.1).¹⁵² This despite the fact that the instant disclosure provides “working examples” of actually reduced-to-practice overlaying and then discloses further “examples” (e.g.; verbal “examples”) of other features related thereto.

¹⁵² In Re Sherwood, 613 F.2d 809, 204 USPQ 537, 544-545 n.8 (CCPA 1980).

The DIS.ASC computer program, implementing the actually reduced-to-practice features of the geometric processor, is disclosed as implementing the features of: geometric processing including rotation, translation, expansion, compression, wrap-around, temporal interpolation, undersampling, display refreshing, transforming, and others. The DIS.ASC is disclosed as performing these operations on the image information stored in image memory. The image memory is disclosed as loaded with the disclosed load program, overlaid with the disclosed LD.ASC program, and filtered and decompressed from database memory with the disclosed FTB.ASC program. The geometric processor, is also disclosed as including 3D-perspective. Other disclosed features of the geometric processor includes the following (see the Table of Contents):

| | |
|--|-----|
| GEOMETRIC PROCESSOR | 66 |
| General Description | 67 |
| Coordinate Systems | 68 |
| Geometric Preprocessing and Postprocessing | 69 |
| Window Geometry | 73 |
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| Image Compression | 102 |
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| Large Image Expansion and Compression Processing | 111 |
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| Address Generator Scaling | 126 |
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| Foreground and Background Tasks | 135 |
| Virtual Scrolling and Wrap-Around | 137 |
| Clipping | 141 |
| Relative Motion | 142 |
| Joystick Controls | 143 |
| Experimental System Video Tape | 146 |
| Other Geometric Processor Configurations | 151 |

The FTR.ASC computer program is disclosed as combining the features of: e.g.; filtering, spatial interpolation, weighting and scaling, a database memory, and mosaic (stripe) processing. In a preprocessing embodiment, the FTR.ASC computer program is implemented as a preprocessor preprocessing image information for subsequent image processing (e.g., DIS.ASC image processing).

Data compression and data decompression processing is also disclosed as being performed in the preprocessing embodiment. The preprocessed image information can be loaded into image memory with the load program for overlaying with the LD.ASC computer program and for geometric processing and displaying with the DIS.ASC computer program. See the video tape photographs in Section 9.2.

The supervisory processor is disclosed as executing the CP/M, DIS.ASC, FTR.ASC, LD.ASC, and GRAPH.ASC computer programs; interacting with system hardware and software (Fig. 1A); interconnected with system input and output devices, interconnected with geometric processors and spatial processors, have multiple interconnections with multiple channels, and interconnected with image memory (Figs. 1A and 1D). The supervisory processor is also disclosed as interacting with the disk database memory, operator controls, image memory, geometric processor, refresh memory, digital to analog converter, and display monitor (Figs. 1A and 1H); interacting with various additional system components (Figs. 1A, 1I, and 1J); and interacting with the geometric processor registers (IC) which in turn interacting with the image memory and the weight memory (Fig. 2I).

The image memory (e.g.; disclosed in a 64-pixel block embodiment) is disclosed as storing image information involved in the execution of the DIS.ASC, LD.ASC, and GRAPH.ASC computer programs. The image memory is also disclosed as being interconnected with database memory and storing mosaic information accessed from the database memory.

The discussion of the legal "examples" of computer programs further illustrate many of the interconnections. For example, the combination of rotating, translating, expanding, compressing, perspective, wrap-around, transform, temporal interpolation, and undersampling are all disclosed as being performed with the geometric processor (which includes the image memory (Figs. 1A and 1D). Further, multiple channels, delta and difference image information, and feedback are all demonstrated with the geometric processor (e.g., Fig. 1A).

The "Overlays" section (Spec. at 386-406) discusses the combinations of hardware, software, image processing, and overlaying various types of image information.

The original Abstract, the original Summary Of The Invention, and the original claims provide significant combinations of features and interconnections therebetween. See the discussion of the original claims in Section 7.3.15.8.

In addition to the extensive teaching of interconnections and interrelations of computer programs, the disclosure has extensive teachings of hardware and hardware/software interconnections and interrelations (briefly discussed above and further discussed below).

The disclosure includes tables of features which are discussed in the disclosure in more detail. See the "MODULAR CONFIGURATION FEATURES TABLE" (Spec. at 24-30); the "EXPERIMENTAL CONFIGURATION FEATURES TABLE" (Spec. at 33); the "DIS.ASC TERMINOLOGY TABLE" (Spec. at 250-255); and the "IMAGE PROCESSING WORKSTATION TABLE" (Spec. at 485). The disclosure also includes the "COMPUTER PORT TABLE" (Spec. at 503) and the "PORT-C DESTINATION SELECT PORT" and "DESTINATION SELECT ASSIGNMENTS" (Spec. at 506-508).

The disclosure also includes the "CABLE CONNECTION TABLE" (Spec. at 510-521) showing system hardware interconnections. See the discussion of cable wire disclosure (Section 7.3.15.7).

The disclosure is proliferated with teachings of combinations and interconnections (e.g.; Spec. at 16 and 17-19; respectively):

One configuration of the system of the present invention is an image processing system capable of geometrically manipulating a highly detailed image in true real time; such as for simultaneous rotation, translation, expansion, compression, 3D perspective, and warping at a 30-times per second update rate. Other capabilities include image enhancement, smoothing, and image filtering; all in real time. The image can be obtained from a wide variety of sources; such as from a video camera or from a database memory.

The block diagram shown in Fig 1A illustrates the modular expandability of the system of the present invention, shown in greater detail in Figs 1B to 1G. A plurality of geometric modules 110A to 110B can be configured in parallel channel form, such as for multiple overlays. The geometrically processed images can be combined with a geometric multiplexer/demultiplexer/combiner 110D. Multiplexing selects a particular geometric processed image channel for subsequent processing. Processing includes overlaying, adding, subtracting, and otherwise selecting and combining of images. For example, many channels of geometrically processed images 110C can be overlayed with occulting priorities. Also, a pair of images can be selected for arithmetic processing, such as for adding together.

The processed and combined images can be demultiplexed with element 110D to route the appropriate images to the appropriate spatial modules 110E to 110F and for feedback to the geometric modules along path 110H. The spatial modules 110G can be implemented in parallel form for processing the images routed thereto. A spatial multiplexer and demultiplexer 110I can be used to multiplex and demultiplex the spatially processed images from spatial modules 110G for outputting.

A plurality of input sources of images 110J and a plurality of output devices for images 110K can be accommodated. The input images from input sources 110L can be processed with the input interfaces 110M and processed with a multiplexer/demultiplexer 110N for routing to geometric modules 110C. Output devices 110K can be excited with images that are processed with the output image interfaces 110P and output multiplexer/demultiplexer 110Q.

Multiplexer/demultiplexer modules 110D, 110N, and 110Q can be implemented to multiplex a plurality of channels into one channel and then to demultiplex that one channel into a plurality of channels. Each multiplexer associated with a channel can be replicated a plurality of times to multiplex a plurality of channels into each single channel. The multiplex signals associated with the plurality of multiplexed channels can then be demultiplexed, permitting routing of any one of a plurality of multiplexer input channels to any one of a plurality of multiplexer output channels. Tri-state multiplexers can be used to multiplex a plurality of channels into a single channel, such as using 74LS365 multiplexer circuits. Parallel fanout and gating networks can be used for demultiplexing. Other types of multiplexers and demultiplexers are well-known and can be used for the multiplexer/demultiplexer modules.

A supervisory processor 110R provides supervisory operations; such as receiving external commands 110S for configuring the system. For example, geometric modules 110C can be controlled for different types of geometric processing with different geometric parameters; spatial modules 110G can be controlled for different types of weights loaded into weight RAMs; and the multiplexer/demultiplexer modules and combiner module 110I, 110N, and 110Q can be selected for multiplexing and demultiplexing of images.

7.3.15.7 The Disclosure Provides Such Extensive Interconnection And Interrelation Details That It Even Includes Details Of Cable Wires

The instant disclosure is so detailed that it includes detailed schematic diagrams (Figs. 6B-6AH), integrated circuit component placement on the circuit boards (Spec. at 522-543), actual wiring between the integrated circuit components (Figs. 6B-6AH), details of cable wires between system components (Spec. at 510-521), and the detailed computer program source code listings (Spec. at 544-574):

| | |
|--|-----|
| VIDEO DAC CONNECTION TABLE | 371 |
| * * * | |
| CABLE CONNECTION TABLE | 510 |
| CABLE-I BM1,2/BL1 (C1) | 511 |
| CABLE-II BM1,2/BL1/BB1 (C2) | 513 |
| CABLE-III BR1/BL1/BB1 (C3) | 515 |
| CABLE-IV BR1/BL1/BB1 (C4) | 517 |
| CABLE-V BL1/COMPUTER PORT-A CONTROL (C5) | 519 |
| CABLE-VI BL1/COMPUTER PORT-B ADDRESS/DATA (C6) | 520 |
| CABLE-VII BL1/COMPUTER PORT-C REGISTER SELECT (C7) | 521 |
| TABLE OF DIP LAYOUT ON BOARDS | 522 |
| BOARD-BM1,2 MEMORY BOARD | 523 |
| BOARD-BB1 BUFFER BOARD | 527 |
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| MEMORY TABLE-A TO MEMORY TABLE-D | 535 |
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| MEMORY TABLE-B | 538 |
| MEMORY TABLE-C | 540 |
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| BASIC PROGRAM LISTING GRAPH.ASC | 544 |
| BASIC PROGRAM LISTING LD.ASC | 547 |
| BASIC PROGRAM LISTING FTR.ASC | 561 |
| BASIC PROGRAM LISTING DIS.ASC | 567 |

Table of Contents (Section 9.1).

Cable List

A cable list is provided in the CABLE CONNECTION TABLE included herewith. This cable list identifies the cables between the various Vector boards and between the Vector boards and the supervisory processor. Each cable between display processor boards is implemented with a 50-pin ribbon cable having odd pins connected to

ground for signal isolation. Each cable between the Vector boards and the supervisory processor is implemented with an RS-232 type 25-pin ribbon cable, consistent with the signal representations for the Compupro Interfacer-II board. The cable list identifies the pin associated with a signal, a symbol associated with the signal, a description of the signal, a representative source of the signal and a representative destination of the signal.

Spec. at 295.

Despite the significant efforts that the Appellant went through to develop and test the actually reduced-to-practice “experimental system” and then to disclose it in significant detail in the instant application, the Examiner has failed to properly consider this very relevant and detailed disclosure. See Section 5.7. See also Sections 7.3.10, 7.3.16, 7.5.8, and 7.5.10.

7.3.15.8 The Image Memory Is Central To Many Interconnections And Interrelations

The image memory is a prominent part of the actually reduced-to-practice “experimental system” (e.g.; Section 5.7), as discussed below. The image memory provides “working examples” of overlaying, image processing, graphics processing, displaying of image information, and many other features. Hence, the image memory by itself provides extensive “working examples” and express teachings for the interconnections and interrelations between the claim limitations.

The term “image memory” occurs more than 300 times in the disclosure.

The image memory is discussed with many of the disclosed features. For example, the “Overlay” section expressly teaches the image memory for overlaying many different types of image information. A single one of the various image memory related excerpts from this single “Overlays” section, together with various different types of image information overlaid therewith, is excerpted below (e.g.; Spec. at 390-391 (emphasis added)):

Graphic overlays that are independent of textured images and that are processed independently of other images will now be discussed. Graphic overlays can be written into a separate graphic **image memory**. This graphic image can be geometrically processed, as discussed for processing of textured images in **image memory**. The geometrically processed image can be output for display, can be overlayed on other graphic images and processed images in other image

memories, and can be otherwise processed as discussed for processing of textured images herein.

Graphic overlays that are fixed in the viewport will now be discussed. Graphic overlays can be written into a separate graphic image memory. These graphic overlays can be referenced to the viewport and can be fixed to the viewport; such as with a viewport frame, alphanumeric characters, and other features that are to remain stationary in the viewport. This fixed graphic image can be scanned-out of the related image memory in raster scan form without rotation, translation, expansion, compression, or other geometric processing.

As another example, the “Overlays” section teaches use of “image memory” for overlaying (and combining, occulting, compositing, and multiplexing) of images and for the processing of these images. The “Image Loading” section (Spec. at 246) provides “working examples” of the loading of picture images into “image memory”, the LD.ASC computer program (Spec. at 547-60) provides “working examples” of the loading of graphic images and processed images into “image memory” and provides “working examples” of the overlaying of the images stored in “image memory” therewith, the DIS.ASC computer program (Spec. at 248-292, 567-574) provides “working examples” of the rotation, translation, expansion, and compression of images stored in “image memory” with temporal interpolation and refreshing the display. The “Database Data Compression” section (Spec. at 435-438) provides “examples” of data compression and data decompression of images stored in “image memory”. The “Virtual Scrolling and Wrap-Around” section (Spec. at 137-140) provides “working examples” of wrap-around. Some of the excerpts from the disclosure regarding these features are discussed below. Various other “examples” of the use of “image memory” are provided in the disclosure. It is worth repeating – “image memory” terminology occurs verbatim more than 300 times in the disclosure. The “image memory”, like the “supervisory processor”, is an important thread that interrelates and interconnects many of the elements and functions of the disclosure.

As another example, image memory is expressly addressed in the “Overlays” section. There are 16 occurrences of the term “image memory” in the “Overlays” section by itself. This is included in the more than 300 occurrences of the term “image memory” in the disclosure. An example of occurrences in the “Overlays” section is excerpted below (e.g.; Spec. at 389 (emphasis added)):

Graphic overlays that are associated with images and geometrically processed with such associated images will now be

discussed. Graphic overlays can be written over an image in image memory to provide a permanent overlay. Such permanent overlays have been demonstrated with the BASIC PROGRAM LISTING LD.ASC Basic provided herein by loading graphic vectors, rectangles, and test patterns and by loading textured image test patterns over an image in image memory.

In view of the above, the "Overlays" section provides clear "working examples" of the overlaying over the images that have been loaded into "image memory" and the processing of images that have been loaded into "image memory". Further, the "Overlays" section provides clear "working examples" of the overlaying over the images into a memory having the features of "image memory"; e.g., the 64-pixel blocks of this "image memory" embodiment.

The "Image Loading" section (Spec. at 246) provides "working examples" of the loading of picture images into "image memory" (e.g.; Spec. at 246 (first emphasis in original, all other emphasis added)):

Image Loading

Loading of an image into memory is performed by loading the XP and YP-address registers with the address of each pixel to be loaded, then outputting the pixel information to be loaded with Port-B, and then strobing the pixel information into image memory with the DOA7 signal. A sequential load feature is provided under control of the DOA5 signal. When the DOA5 signal is high, a vector can be loaded; where the previously loaded pixel address is incremented with the related delta parameter to obtain the next pixel address to reduce software overhead and thereby speedup loading of image memory.

Loading of image memory with the supervisory processor is performed with a 3-port output arrangement having 8-bits per port. The first port, Port-A, communicates control signals between the supervisory processor and the display processor. The second port, Port-B, communicates address and data information to be loaded into the display processor between the supervisory processor and the display processor. The third port, Port-C, selects the register or memory in the display processor for loading. The protocol involves outputting of the destination address on Port-C, outputting of information to be loaded into the display processor on Port-B, and then outputting of a data strobe on Port-A. The data strobe loads the output information into the selected destination.

A program to load vectors into memory is provided herein as the BASIC PROGRAM LISTING LD.ASC and is briefly discussed in the section entitled Software herein.

The LD.ASC computer program (Spec. at 547-560) provides “working examples” of the loading of graphic images and processed images into “image memory” and provides “working examples” of the overlaying of the images stored in “image memory” therewith.¹⁵³

GRAPHICS PROCESSOR

A graphics processor architecture can be implemented with a address generator and control logic generating graphics vectors for storing into image memory. Image memory can then be scanned out, such as in a raster scan form to refresh a display. In one configuration, graphics vectors can be written into image memory on an offline basis and can be used to refresh the display on an online basis. Alternately, graphics vectors can be written into image memory on an online basis time shared with refreshing of the display on an online basis.

One arrangement of the graphics system of the present invention is shown in Fig 1. Supervisory processor 115A loads graphics commands into address generators 115B. Address generators 115B generate addresses of graphics vectors for loading into image memory 115C and for raster scanning image memory 115C. The raster scan addresses scan-out the image in image memory 115C through the CRT interface 115D to refresh CRT 115E.

An experimental system has been constructed to demonstrate operation of the graphics display capability. The arrangement shown in Fig 1 has been implemented in hardware for refreshing the display in real time. A program, such as the BASIC PROGRAM LISTING GRAPH.ASC, can be used to control that experimental hardware for refreshing the display. In this experimental system, the graphics vectors are loaded in an offline manner with the LD.ASC Basic program set forth in the BASIC PROGRAM LISTING LD.ASC herein; emulating hardware loading of graphics vectors in an online manner. In this experimental system, graphics operation is initiated each frame with supervisory processor 115A and hardware refresh is performed with address generators 115B and image memory 115C....

The address generators can be used to generate graphic vectors and windows. For example, the LD.ASC program set forth in the BASIC PROGRAM LISTING LD.ASC herein has been used to

¹⁵³ E.g.; Spec. at 155-158, and 389 (first emphasis in original, all other emphasis added).

load graphic vectors into image memory. This is achieved by using the address generators to generate the addresses of a vector and by strobing the color intensity of the vector into image memory.

Graphic overlays can be written over an image in image memory to provide a permanent overlay. Such permanent overlays have been demonstrated with the BASIC PROGRAM LISTING LD.ASC Basic provided herein by loading graphic vectors, rectangles, and test patterns and by loading textured image test patterns over an image in image memory.

Loading and overlaying into image memory is also taught in the LD.ASC computer program (e.g.; Spec. at 548 (emphasis added)):

```

120 PRINT "SELECT OVERLAY FOR LOADING INTO IMAGE MEMORY ... 1"
122 PRINT "SELECT IMAGE TO BE LOADED INTO IMAGE MEMORY"
124 PRINT "    CONCENTRIC SQUARE FRAMES ..... 2"
126 PRINT "    RECTANGLES AND LINES ..... 3"
128 PRINT "    SPIRALS ..... 4"
130 PRINT "    VIEWPORT COORDINATE SYMBOLS ..... 5"
132 PRINT "    PATTERN #6 ..... 6"
134 PRINT "    PATTERN #7 ..... 7"
136 PRINT "    SQUARE PATTERN ..... 8"
138 PRINT "    SQUARE FRAMES ..... 9"
140 PRINT "    PERIPHERAL SQUARES ..... 10"
141 PRINT "    PERIPHERAL TRIANGLES ..... 11"
142 PRINT "    HOUSE ..... 12"
151 INPUT "SELECT OPERATION NUMBER";A20%
152 IF A20%<13 THEN 155
153 PRINT "*****": PRINT "IMPROPER SELECTION":
    PRINT "*****"
154 GOTO 112
155 IF A20%>0 THEN 158
156 SYSTEM
158 ON A20% GOSUB 170, 4400, 4530, 5500, 4500, 7500, 8500, 9000, 9040,
    9180, 9280, 11070
159 GOTO 112
170 PRINT: PRINT "*****"
171 PRINT "    SELECT OVERLAY FOR LOADING INTO IMAGE MEMORY"
172 PRINT "*****": PRINT
173 PRINT "    RETURN TO MAIN MENU ..... 0"
174 PRINT "    SELECT RECTANGULAR IMAGE MEMORY PATTERN"
180 PRINT "    HORIZONTAL BARS"
200 PRINT "    3_2_2 WIDTH BARS, INTENSITY VARIATIONS . 1"
220 PRINT "    1_1_1 WIDTH BARS, MAXIMUM INTENSITY ... 2"
240 PRINT "    LINEAR COUNT, ALL COLOR COMBINATIONS .. 8"
260 PRINT "    SOLID SINGLE COLORED IMAGES"
265 PRINT "    RECTANGLE ..... 3"
270 PRINT "    BACKGROUND ..... 4"
400 PRINT "    CHECKERBOARD"
420 PRINT "    4_COLORS ..... 6"

```

```

440 PRINT " 2_COLORS ..... 7"
442 PRINT " VARIABLE SINGLE COLORS"
443 PRINT " GREEN SAWTOOTH ..... 10"
460 PRINT " CENTER ELEMENT"
480 PRINT " 9_PIXEL SQUARE ..... 11"
482 PRINT " SELECT SLOPING LINE ..... 12"
484 INPUT " SELECT PATTERN NUMBER";A5%
486 IF A5%>0 THEN 502

```

The DIS.ASC computer program (Spec. at 248-292, 567-574) provides “working examples” of the rotation, translation, expansion, and compression of images stored in “image memory” (e.g.; Spec. at 262-263, 278-279, and 375 (emphasis added)):

The following code defines the image memory dimensions; which are 512-pixels per line (X5I) and 512-lines per image (Y5I) for this implementation.

```

1080 X5I=512: Y5I=512 'IMAGE MEMORY DIMENSIONS IN
PIXELS

```

The following code represents calculations for geometric window relationships. These relationships pertain to prior window configurations, which are discussed with reference to Figs 2C, 2D, and 2G. Because these relationships represent prior relationships, they are deleted with apostrophes and maintained as annotations.

```

1100 'AR1=SQR(X5V^2+Y5V^2)'UNITS OF PIXELS
1120 'AAP1=ATN(Y5V/X5V)
1140 'AA6=ATN(X5V/Y5V): AP1=90*DR-A6

```

The following code defines the image memory dimensions in eighth pixel units by multiplying the image memory dimensions X5I and Y5I by 8-eighth pixel units.

```

1160 KS1%=X5I*8: KS2%=Y5I*8 'IMAGE MEMORY DIMENSIONS
IN EIGHTH PIXELS

```

The following code defines parameters Q2 and Q3 in terms of the viewport dimensions and in terms of the offset of the center of rotation.

```

1180 Q2=(Y5V/2)-TY: Q3=(X5V/2)+TX

```

The following code calculates the window parameters for the selected window geometry.

```

1200 IF PR32$="Y" GOTO 1260
1220 AP1=ATN(Q2/Q3): R1=2*SQR(Q2^2+Q3^2)
1240 KB1=R1*8*SIN(AP1)/2: KB2=R1*8*COS(AP1)/2: GOTO 1280
1260 KB1=Q2*8: KB2=Q3*8

```

The following code defines initial conditions for scaling prior to receipt of joystick commands.

1280 DS11=1: JSS%=128

The following code calculates the initial conditions for the center of the image memory, XC1 and YC1, relative to the center of the viewport and rescales the center coordinates, XC1 and YC1, and offset parameters, TX and TY, to subpixel units with the multiplication by eight.

1300 XC1=(X5I/2+X1)*8: YC1=(Y5I/2+Y1)*8: TX=TX*8: TY=TY*8

The following code calculates the resolved joystick translation commands. The joystick commands are implemented to be in viewport coordinates. Consequently, rotation of the image rotates the image in the image memory relative to the viewport, where the joystick translation axis, which are image memory coordinate related, also rotate. In order to reference the translation axes to the viewport coordinates, the joystick translation commands are resolved from image memory coordinates into viewport coordinates by summing the resolved components from the image memory coordinates to obtain the translation commands in viewport coordinates.

3600 JSYK%=JSYB%*KSAR: JSXK%=JSXB%*KSAR

3620 JSXB%=JSXB%*KCAR+JSYK%:JSYB%=JSYB%*KCAR-JSXK%

The image received from the source of the image can be buffered in a buffer memory for preprocessing. The buffered image can be loaded into image memory for geometric processing when the geometric processing goes beyond the limits of the image stored in image memory. For example, when the image in image memory is to be translated past a boundary of image memory, or is to be compressed below a compression threshold, or otherwise processed beyond the limits of the image; the buffered image can be loaded into image memory to continue geometric processing.

The "Database Data Compression" section (Spec. at 435-438) provides "examples" of data compression and data decompression of images stored in "image memory" (e.g.; Spec. at 437 (emphasis added)):

Compressed information can be decompressed prior to loading into image memory so that images in image memory are in decompressed form. Alternately, compressed information can be stored in image memory and can be decompressed when processed as an output of image memory. Geometric processing can be performed on decompressed information stored in image memory; where decompression can be performed prior to geometric processing, such as before loading into image memory or after accessing from image memory. Geometric processing can be performed on compressed information in image memory; where decompression can be performed subsequent to geometric processing, such as before spatial processing or after spatial processing.

The original claims address image memory for machine vision, for storing a reference image, for storing a part of a database image, for processing the image stored in the image memory, for geometrically processing -- compressed, expanded, rotated, translated, warped, and perspective -- the image stored in image memory (emphasis added):

3. A machine vision system comprising:
means for acquiring an input image;
means for storing a reference image;
means for registering the input image and the reference image;
means for comparing the registered input image and reference image; and means for generating an output signal in response to the comparing with said comparing means.

4. The system as set forth in claim 3 above, wherein said acquiring means is a video camera for acquiring the input image, wherein said storing means is an image memory for storing the reference image, wherein said registering means is a geometric processor for rotating, translating, and scaling the input image to cause the input image to register with the reference image, and wherein said comparing means is a spatial filter for comparing the registered input image and reference image; said system further comprising artificial intelligence means for processing the output signal.

5. A system for processing an image comprising:
a database for storing a database image;
an image memory for storing a portion of the database image;
memory loading means for loading a portion of the database image into said image memory including means for scrolling the database image into said image memory to provide image motion; and
a processor for processing the image stored in said image memory to provide a processed image.

6. The system as set forth in claim 5 above, wherein said database includes a digital memory for storing a database image having more than 10-million pixels, wherein said image memory includes means for storing a portion of the database image having less than 2-million pixels, wherein said memory loading means includes means for loading a portion of the database image into said image memory, and wherein said processor includes means for geometrically processing the image stored in said image memory to provide a geometrically processed image, means for spatially processing the

geometrically processed image from said image processor to provide a geometrically and spatially processed image, and display means for displaying the geometrically and spatially processed image.

7. A geometric processor comprising:

means for storing an image;

means for scanning out the image stored in said storing means;

means for displaying the image scanned out with said scanning out means.

8. The processor as set forth in claim 7 above, wherein said storing means includes an image memory for storing the image in memory map form, wherein said scanning out means includes means for scanning out the image stored in said image memory at an angle to provide a rotated scanned out image, and wherein said displaying means includes means for displaying the image scanned out with said scanning out means as a rotated image.

9. The processor as set forth in claim 7 above, wherein said storing means includes an image memory for storing the image in memory map form, wherein said scanning out means includes means for scanning out the image stored in said image memory at greater than pixel sampling steps to provide a compressed scanned out image, and wherein said displaying means includes means for displaying the image scanned out with said scanning out means as a compressed image.

11. The processor as set forth in claim 7 above, wherein said storing means includes an image memory for storing the image in memory map form, wherein said scanning out means includes means for scanning out the image stored in said image memory at less than pixel sampling steps to provide an expanded scanned out image, and wherein said displaying means includes means for displaying the image scanned out with said scanning out means as an expanded image.

12. The processor as set forth in claim 7 above, wherein said storing means includes an image memory for storing the image in memory map form, wherein said scanning out means includes means for scanning out the image stored in said image memory at varying pixel sampling steps to provide a warped scanned out image, and wherein said displaying means includes means for displaying the image scanned out with said scanning out means as a warped image.

13. The processor as set forth in claim 7 above, wherein said storing means includes an image memory for storing the image in memory map form, wherein said scanning out means includes means for scanning out the image stored in said image memory at range variable

pixel sampling steps to provide a 3D perspective scanned out image, and wherein said displaying means includes means for displaying the image scanned out with said scanning out means as a 3D perspective image.

14. The processor as set forth in claim 7 above, wherein said storing means includes an image memory for storing the image in memory map form, wherein said scanning out means includes means for scanning out the image stored in said image memory at a range variable angle to provide a 3D perspective scanned out image, and wherein said displaying means includes means for displaying the image scanned out with said scanning out means as a 3D perspective image.

The image memory is significantly related to the database memory and to the mosaics (stripes) in the disclosed actually reduced-to-practice "experimental system".

The image memory has significant relevant disclosure, as discussed above. It is disclosed as part of the actually reduced-to-practice "experimental system" which includes "working examples" of hardware embodiments and which includes computer source code for various claim limitations. It provides important intraconnections and intrarelations between computer programs, between hardware, and between image information and it provides important interconnections and interrelations between computer programs, hardware, and image information.

7.3.16 The Appellant Has Even Filed With The PTO Video Tapes Of The Operation Of The Disclosed "Experimental System"

The Appellant invented, designed, constructed, and operated an "experimental system" and the Appellant took video tape moving pictures of the operation of this "experimental system". The Appellant then filed copies of these video tapes with the PTO in the document disclosure program and cited to and incorporated-by-reference these video tapes in the instant application (Spec. at pages 146-150).

The instant disclosure goes far beyond the requirements of § 112-1. It provides detailed schematic diagrams down to the electronic component, pin, and wire level of detail (e.g., Section 7.5.5), listings of computer programs with detailed discussions thereof, and even the component layout on wire-wrap boards. It then incorporates-by-reference video tapes of the operation of the "experimental

system". Yet the Examiner has not properly considered this extensive disclosure, the Examiner misrepresented the "experimental system", and the Examiner ignored the video tapes thereof. Thus, for this reason alone, the Examiner has not established a prima facie case for the § 112-1 rejections.

7.4 THE § 112-1 WRITTEN DESCRIPTION REJECTIONS

7.4.1 Introduction

The Appellant traverses the § 112-1 written description rejection. The § 112-1 written description rejection is based on erroneous and conclusory statements which violate the law of the Federal Circuit. '[W]e review the Board's underlying factual findings for substantial evidence Broad conclusory statements standing alone are not "evidence".'¹⁵⁴ Consequently, the § 112-1 written description rejection must fall. Further, the Examiner has improperly grouped the claims together in a common § 112-1 written description rejection based upon a so-called "example" claim (Sections 5.5 and 7.3.5.2) and hence fails to establish a prima facie case of lack of written description under § 112-1.

Written description requires the disclosure to reasonably convey to an artisan that the Appellant had possession of the claimed invention. See Vas-Cath and Wertheim.¹⁵⁵ As established below, the instant disclosure **reasonably conveys** possession of the claimed invention.

The § 112-1 rejections do not, and in fact cannot,¹⁵⁶ establish a prima facie case of lack of written description.

The Appellant respectfully traverses the § 112-1 written description rejection for the reasons discussed in Sections 7.4.2 et seq.

7.4.2 The Established Law On Written Description

Written description does not require multitudes of pages of disclosure nor enabling-type detail.¹⁵⁷ Written description involves whether each contested claim limitation can be found in the disclosure.¹⁵⁸

¹⁵⁴ In re Kotzab, 55 USPQ2d 1313, 1316-17 (Fed. Cir. 2000).

¹⁵⁵ Vas-Cath Inc. v. Mahurkar, 935 F.2d 1555, 19 USPQ2d 1111 (Fed. Cir. 1991); In re Wertheim, 541 F.2d 257, 265, 191 USPQ 90, 99 (CCPA 1976).

¹⁵⁶ The Examiner cannot establish a prima facie case of lack of written description because the claims find ample antecedent basis in the extensive and detailed disclosure.

In order to satisfy the written description requirement ... one skilled in the art, reading the original disclosure, must “immediately discern the limitation at issue” in the claims.

Purdue Pharma.¹⁵⁹

Any time an examiner bases a rejection ... on the lack of a written description, the examiner should: (A) identify the claim limitation not described; and (B) provide reasons why persons skilled in the art at the time the application was filed would not have recognized the description of this limitation in the disclosure of the application as filed.

MPEP 2163.04 (emphasis added).

To comply with the written description requirement of 35 U.S.C. 112, ¶ 1 ... each claim limitation must be expressly, implicitly, or inherently supported in the originally filed disclosure.

PTO Guidelines at Section II.A.3.a,(2)b.¹⁶⁰ However, in blatant defiance of the foregoing, the Examiner relies on two claim limitations of a single so-called example claim to support the § 112-1 written description rejection (Sections 5.5 and 7.3.5.2).

The CCPA in Angstadt held that the written description requirement is relatively simple to comply with:¹⁶¹

Two of the first paragraph requirements indicated above, i.e., the “description of the invention” and the “best mode” requirements, are relatively simple to comply with and thus will ordinarily demand minimal concern on the part of the Patent Office * * * What is of maximum concern in any analysis of whether a particular claim is supported by the disclosure in an application is whether that disclosure contains sufficient teaching regarding the subject matter of the claims as to enable one skilled in the pertinent art to make and use the claimed invention.

¹⁵⁷ This notwithstanding the fact that the instant application provides significant details.

¹⁵⁸ The rule for the written description requirement is that it should be reasonably applied and that the disclosure of the claim limitations need not be verbatim, but can be implicit or inherent.

¹⁵⁹ Purdue Pharma v. Faulding, 230 F.3d 1320, 56 USPQ2d 1481, 1483 (Fed. Cir. 2000) (emphasis added); see also Waldemar Link GmbH & Co. v. Osteonics Corp., 32 F.3d 556, 558, 31 USPQ2d 1855, 1857 (Fed. Cir. 1994).

¹⁶⁰ Guidelines for the Examination of Patent Applications Under the 35 U.S.C. 112, ¶ 1, “Written Description” Requirement; Official Gazette 1242 O.G. 168 (January 30, 2001) (emphasis added).

¹⁶¹ In re Angstadt and Griffin, 537 F.2d 498, 190 USPQ 214, 217 (CCPA 1976) (emphasis added).

The Examiner disregarded the CCPA's directive -- that the written description requirement is "relatively simple to comply with and thus will ordinarily demand minimal concern on the part of the Patent Office". This notwithstanding the fact that the disclosure contains hundreds of occurrences of claim limitations, many of which occurrences recite claim limitations verbatim.

The Federal Circuit confirmed that the only disclosure needed for a firmware embodiment in the "general function of the firmware":

While we agree that the '302 patent only discloses the general function of the firmware without teaching mathematical formulas, flow charts, or a firmware program listing, no more was needed here.

Hayes.¹⁶² However, firmware disclosures and software disclosures are both computer program-type disclosures and the instant disclosure relates to such a computer program-type disclosure. Thus, "no more is needed here" in the instant application. This despite the fact that much much more is provided here in the instant application. The MPEP confirms the significant Federal Circuit authorities establishing the discretion in evaluating written description, particularly for software aspects of inventions.

The claimed invention subject matter need not be described literally, i.e., using the same terms, in order for the disclosure to satisfy the description requirement. Software aspects of inventions may be described functionally. See Robotic Vision, Fonar, and Hayes (Sections 7.4.2, 7.5.2, 7.5.6.1, and 7.5.8.4).¹⁶³ This is fully satisfied in the instant disclosure where some of the claim limitations are recited verbatim in the disclosure and some of the remaining claim limitations are recited near-verbatim¹⁶⁴ in the disclosure. This is addition to extensive disclosures of the actually-reduced-to practice "experimental system" and extensive disclosures of features related thereto. This is graphically illustrated by the CCPA in Bowen.¹⁶⁵

¹⁶² In re Hayes Microcomputer Products Inc., 982 F.2d 1527, 25 USPQ2d 1241, 1248 (Fed. Cir. 1992) (emphasis added).

¹⁶³ See Robotic Vision Sys. v. View Eng'g. Inc., 112 F.3d 1163, 1166, 42 USPQ2d 1619, 1622-23 (Fed. Cir. 1997); Fonar Corp. v. General Electric Co., 107 F.3d 1543, 1549, 41 USPQ2d 1801, 1805 (Fed. Cir. 1997); In re Hayes Microcomputer Prods., Inc., 982 F.2d 1527, 1537-38, 25 USPQ2d 1241, 1248-49 (Fed. Cir. 1992).

¹⁶⁴ The term "near-verbatim" is intended to mean the same root of the word but with "near" differences such as singular, plural, -ing, and -ed.

¹⁶⁵ In re Bowen, 492 F.2d 859, 181 USPQ 48, 52 (CCPA 1974) (emphasis added).

The solicitor's reliance on what this court has referred to as the "description requirement" of the first paragraph of § 112 is misplaced. The so-called "description requirement," which exists in the first paragraph independent of the enablement (how to make and how to use) portions, serves essentially two functions.... Both are fully defeated by a specification, which describes the invention in the same terms as the claims. Here there has been no assertion by the board or the examiner that there is any lack of correspondence between the appealed claims and the specification (including the original claims) as filed. Indeed the scope of the language of the specification clearly corresponds to the language of the claims, the "polymerizable material" of the claims being referred to variously by the specification as a "polymer" and a "*polymerizable mass * * * added * * ** as an aqueous solution of monomeric *material*, such as hexamethylenediamine adipate." (Emphasis supplied.)* Thus there is no basis for the solicitor's reliance upon the description requirement as support for the rejection here.

Just as in Bowen where reciting the term "polymer" in the disclosure provides adequate written description for the claim limitation "polymerizable material"; the terminology in the instant disclosure provides adequate written description for the claim limitations. The Federal Circuit requires no more.

The Federal Circuit confirmed in Hunter that written description can be satisfied with any one of various different methods:¹⁶⁶

Depending upon the facts of each particular case, one may satisfy the written description requirement using, for example, drawings, tables, equations, and formulas, alone or in combination.

The Federal Circuit in Union Oil uses a simple tabular method to illustrate written description (Section 7.4.8).

According to the Deputy Assistant Commissioner for Patent Policy and Projects,¹⁶⁷ electrical applications with detailed drawings meet the written description requirement:

¹⁶⁶ In re Hunter, No. 94-1301, 1995 U.S. App. LEXIS 15363, at *14 (Fed. Cir. June 19, 1995) (emphasis added).

¹⁶⁷ Stephen G. Kunin, "Written Description Guidelines and Utility Guidelines," Journal of the Patent and Trademark Office Society (JPTOS), Vol. 82, No. 2 at page 87 (February 2000).

[I]n most applications which include detailed drawings, e.g., most mechanical and electrical applications, the examiner will be able to quickly determine that the written description requirement has been met.

Consistent therewith, the instant application is an electrical application and it has detailed electrical-related drawings.

Further, it is black-letter law that an original claim is its own written description. Hence, written description needs no more detail than the limitations recited in the claim. See Purdue and Bowen above.

See also the following:

Where the claim is an original claim, the underlying concept of insuring disclosure as of the filing date is satisfied, and the description requirement has likewise been held to be satisfied.

Smith.¹⁶⁸

Claim 2, which apparently was an original claim, in itself constituted a description in the original disclosure equivalent in scope and identical in language to the total subject matter now being claimed. See *In re Anderson*, 471 F.2d 1237, 176 USPQ 331 (CCPA 1973). Nothing more is necessary for compliance with the description requirement of the first paragraph of 35 U.S.C. 112.

Gardner.¹⁶⁹ Similarly, the ITC held that disputed “claim language” found in an original claim satisfies written description and the ITC held that an Applicant can rely on parts of an original claims for written description:

The ALJ found claim 9 of the '838 patent invalid under 35 U.S.C. § 112 as not meeting the written description and claim precision requirements because claim 9 calls for “jaws which grip the fastener at opposite ends,” but the specification and drawings show gripping at one end. Since the claim language questioned is part of original claim 9, it is its own description, and there is no failure to meet the written description requirement.

Plastic Fasteners.¹⁷⁰ It is also black-letter law that a claim defines the “boundary” of the claimed invention and is not a detailed technical description.

¹⁶⁸ *In re Smith*, 481 F.2d 910, 178 USPQ 620, 624 (CCPA 1973).

¹⁶⁹ *In re Gardner*, 475 F.2d 1389, 177 USPQ 396, 397 (CCPA 1973).

The purpose of claims is not to explain the technology or how it works, but to state the legal boundaries of the patent grant.

S3 Inc.¹⁷¹

A claim is a group of words defining only the boundary of the patent [property].

Buehler.¹⁷²

A claim is a group of words defining only the boundary of the patent monopoly. It may not describe any physical thing and indeed may encompass physical things not yet dreamed of.

Vogel¹⁷³

Distinguishing what infringes from what doesn't is the role of the claims....

Gore.¹⁷⁴

Hence, because an original claim is its own written description and because a claim defines a “boundary” of an invention, written description requires no more detail than a recitation in a claim.

Despite the fact that written description does not require any more disclosure than claim limitations (e.g., an original claim is its own written description (discussed below)) and despite the fact that the instant disclosure provides verbatim and near-verbatim support for many of the claim limitations, written description does not even require disclosure of the same words as the claim limitations – it is adequate for the antecedent basis to be express, implicit, or inherent in the disclosure.

¹⁷⁰ In re Certain Plastic Fasteners and Processes for the Manufacture Thereof, 1987 ITC Lexis 271 (ITC 1987) (on Petition For Review) (emphasis added).

¹⁷¹ See S3 Inc. v. nVIDIA Corp., 259 F.3d 1364, 59 USPQ2d 1745, 1748 (Fed. Cir. 2001).

¹⁷² In re Buehler, 515 F.2d 1134, 185 USPQ 781, 787 (CCPA 1975).

¹⁷³ In re Vogel, 422 F.2d 438, 164 USPQ 619 (CCPA 1970).

¹⁷⁴ W. L. Gore & Associates, Inc. v. Garlock, Inc., 721 F.2d 1540, 1557 (Fed. Cir. 1983).

While there is no in haec verba requirement, newly added claim limitations must be supported in the specification through express, implicit, or inherent disclosure.

PTO Guidelines at Section I.B.¹⁷⁵

2163.02 Standard for Determining Compliance With the Written Description Requirement

* * *

The subject matter of the claim need not be described literally (i.e., using the same terms or in haec verba) in order for the disclosure to satisfy the description requirement.

MPEP 2163.02.

Where the language of the claims is descriptively supported either in a drawing or, for example, as the cumulative effect of numerous specific embodiments described in the application, it is not necessary that the specific language used as a definition in the claim also be used in the specification as originally filed.

Kayton¹⁷⁶

The function of the description requirement is to ensure that the inventor had possession of, as of the filing date of the application relied upon, the specific subject matter later claimed by him; how the specification accomplishes this is not material. In re Smith, 481 F.2d 910, 178 USPQ 620 (CCPA 1973). The claimed subject matter need not be described in haec verba to satisfy the description requirement. In re Smith, 59 CCPA 1025, 458 F.2d 1389, 173 USPQ 679 (CCPA 1972). It is not necessary that the application describe the claim limitations exactly, but only so clearly that one having ordinary skill in the pertinent art would recognize from the disclosure that appellants invented processes including those limitations. In re Smythe, 480 F.2d 1376, 178 USPQ 279 (CCPA 1973).

¹⁷⁵ Guidelines for the Examination of Patent Applications Under the 35 U.S.C. 112, ¶ 1, "Written Description" Requirement; Official Gazette 1242 O.G. 168 (January 30, 2001).

¹⁷⁶ Kayton, I., Patent Practice, Fifth Edition, Vol. 3, Chapter 11, page 92 (Patent Resources Institute, 1993).

Herschler.¹⁷⁷ Notwithstanding the fact that the disclosure has extensive verbatim and near-verbatim support for many of the claim limitations, such verbatim and near-verbatim support is not even required for written description:

Compliance with the written description requirement of Section 112 only requires that appellant's application contain sufficient disclosure, **expressly or inherently**, to make it clear to persons skilled in the art that appellant possessed the subject matter claimed. In re Mott, 539 F.2d 1291, 190 USPQ 536, 541 (CCPA 1976). The test for determining compliance with the written description requirement is whether the disclosure of the application as originally filed **reasonably** conveys to the artisan that the inventor had possession of **the claimed subject matter**, rather than the presence or absence of literal support in the specification for the claim language. In re Kaslow, 707 F.2d 1366, 217 USPQ 1089, 1096 (Fed. Cir. 1983).

Harvey.¹⁷⁸

The Federal Circuit in Union Oil¹⁷⁹ cited to Vas-Cath with approval stating (emphasis added):

However, neither the Patent Act nor the case law of this court requires such detailed disclosure. *See ... Vas-Cath*, 935 F.2d at 1566 ("ranges found in applicant's claims need not correspond exactly to those disclosed in [the specification]; **issue is whether one skilled in the art could derive the claimed ranges from the [] disclosure.**")

The court then quoted this Vas-Cath statement yet a second time. See Union Oil at 1235.

In the instant application, the Examiner did not properly consider Union Oil and Vas-Cath, the Examiner did not properly address the disclosure from the standpoint of "one skilled in the art", and the Examiner did not address what "one skilled in the art" could **derive** from the disclosure. Thus, the § 112-1 written description rejection must fall.

For example, the Examiner should have, but did not, address the very compelling issues of why one skilled in the highly predictable computer system art who was in possession of the extensive instant disclosure would not recognize that the Appellant was in possession of the claimed invention.

¹⁷⁷ In re Herschler, 591 F.2d 693, 700-01, 200 USPQ 711, 717 (CCPA 1979) (emphasis added).

¹⁷⁸ Ex Parte Harvey, 3 USPQ2d 1626, 1627 (Bd. Pat. App. and Int. 1986) (emphasis added).

¹⁷⁹ Union Oil Co. of California v. Atlantic Richfield, 208 F.3d 989, 54 USPQ2d 1227, 1233 (Fed. Cir. 2000).

Judge Stewart in Hyatt-'211¹⁸⁰ (emphasis added) stated:

We have considered, in detail, the language objected to by the examiner, but find the language to be reasonably descriptive of the invention.... Accordingly, we will not sustain the rejection.

Thus, the written description requirement must be reasonably applied.

The PTO Guidelines¹⁸¹ confirm the relevance of reduction-to-practice to written description:

Possession may be shown in a variety of ways including description of an actual reduction to practice

However, the rejection does not properly address the disclosed actually reduced-to-practice “experimental system”. When the Appellant has gone through all of the effort and expense to actually reduce-to-practice and to disclose in detail an embodiment, the Examiner is required to consider this very important evidence. The Examiner must consider the disclosure as a whole “taking into account evidence that ... detracts from an agency’s decision”.

The [U.S. Supreme] Court has emphasized that “substantial evidence” review involves examination of the record as a whole, taking into account evidence that both justifies and detracts from an agency’s decision. See Universal Camera Corp. v. NLRB, 340 U.S. 474, 487-88 (1951).

Gartside.¹⁸²

In view of the above, written description is satisfied with an original¹⁸³ “group of words defining only the boundary of the patent monopoly” – the “limitations” of a claim. See, e.g., Purdue above. Certainly, the instant disclosure with its hundreds of relevant occurrences of claim limitations (e.g.; Section 5.4) and its thousands of interconnections and interrelations satisfies written description.

¹⁸⁰ Ex parte Hyatt, Appeal No. 91-2061, Paper No. 28 at 9 in patent application Serial No. 07/662,211 (PTO Bd. App. December 20, 1991) [herein Hyatt-'211] (unpublished PTO decision).

¹⁸¹ Guidelines for Examination of Patent Applications Under the 35 USC 112, § 1, ‘Written Description’ Requirement; Official Gazette at 1242 OG 168, 172 (January 30, 2001).

¹⁸² In re Gartside, 53 USPQ2d 1769, 1773 (Fed. Cir. 2000).

¹⁸³ Either an original claim or original words in the specification.

7.4.3 The Examiner Admits That He Used The Anticipation Rejection Standard For The Written Description Rejections – For This Reason Alone, The Written Description Rejections Must Fall

The written description rejection must fall for the reason that the Examiner used the wrong standard for the written description rejection. The Examiner admits that he used the anticipation standard (§ 102) for the written description rejection (instant Action at 5, 16, and 25,; respectively):

One additional element to this criteria is noteworthy. That is, written description is analogous to anticipation, not obviousness. The claimed inventions must be anticipated by the original disclosure, not obvious in view of the original disclosure.

Again, as in the *Ruschig* decision, the examiner is reading the specification from the "standpoint of one with no foreknowledge" of the now claimed invention. Further, an "anticipation" standard, not an "obviousness" standard is relied upon. However, the examiner cannot find his way through the forest; at least without the claim as a guide and a lot of "obviousness".

The question is whether or not the applicant invented the claimed subject, or whether the original disclosure anticipated the claimed subject matter, BEFORE the claim was drafted

However, this is not the standard for the written description rejections. The correct test (standard) for written description is set forth in *In re Kaslow*.¹⁸⁴

The test for determining compliance with the written description requirement is whether the disclosure of the application as originally filed reasonably conveys to the artisan that the inventor had possession at that time of the later claimed subject matter, rather than the presence or absence of literal support in the specification for the claim language. *In re Edwards*, 558 F.2d 1349, 196 USPQ 465 (CCPA 1978); *In re Herschler*, 591 F.2d 693, 200 USPQ 711 (CCPA 1979).

¹⁸⁴ *In re Kaslow*, 707 F.2d 1366, 217 USPQ 1089, 1096 (Fed. Cir. 1983).

In contrast to the standard for written description, the test for anticipation is “identity”. See Kalman.¹⁸⁵ and SRI.¹⁸⁶ See also Section 7.4.2. Thus, for this erroneous reason alone – that the test for written description is “anticipation” – the written description rejection must fall.

“Identity” is similar to verbatim. However, verbatim is expressly **not** the test for a written description rejection (Section 7.4.7). This is not surprising, “identity” and verbatim are very strict tests to meet, **but they are not the tests for written description**.

It is incontrovertible that the Examiner did not establish a prima facie case for lack of written description with his use of the wrong standard for establishing *vel non* written description.

Judge Radar stated in his concurring opinion in Alappat.¹⁸⁷

The Supreme Court has frequently cautioned that “courts should not read into the patent laws limitations and conditions which the legislature has not expressed.”...This same counsel applies to the Board.

Clearly, the Examiner is prohibited from making up his own written description standard. Thus, for this reason alone, the written description rejections should be reversed.

7.4.4 The § 112-1 Written Description Rejections Would Have Been Resolved If The Examiner Had Properly Construed The Claims According To The Federal Circuit's Recent *En Banc* Decision In *Phillips*

The Federal Circuit's recent en banc decision in Phillips should be dispositive of the § 112-1 written description issues. See Section 7.2.6.

To the degree that the disclosure recites terminology that is reasonably representative of the claim limitations (which is the significant majority of the claim recitations), the Examiner **must** construe these claim limitations according to this disclosed meaning (the disclosure constitutes “intrinsic” evidence

¹⁸⁵ Kalman v. Kimberly-Clark Corp., 713 F.2d 760, 771, 218 USPQ 781, 789 (Fed. Cir. 1983), cert. denied, 465 U.S. 1026, 224 USPQ 520 (1984), overruled in part on another ground.

¹⁸⁶ SRI Int'l v. Matsushita Elec. Corp. of Am., 775 F.2d 1107, 1125, 227 USPQ 577, 588-89 (Fed. Cir. 1985) (in banc).

¹⁸⁷ In re Alappat, 33 F.3d 1526, 31 USPQ2d 1545, 1591 (Fed. Cir. 1994).

according to the Federal Circuit's recent en banc decision in Phillips). These claim limitations prima facie satisfy the § 112-1 written description requirements. Hence, for this reason alone, the § 112-1 written description rejection of such claim limitations should be reversed. Further, the Examiner has not construed such claim limitations regarding the § 112-1 written description requirement, which in itself is fatal to the § 112-1 written description rejections. Because these claim limitations are expressly disclosed, as shown in Table 5.1 and 5.3 (Sections 5.1 and 5.4), the § 112-1 written description requirement is satisfied.

To the degree that the disclosure does not recite terminology that is reasonably representative of claim limitations (which is relatively few of the claim recitations), the Examiner must construe these few claim limitations according to this disclosed meaning (“intrinsic” evidence). To the extent that this can be done, these claim limitations satisfy the § 112-1 written description requirement. Hence, for this reason alone, the § 112-1 written description rejection of such claim limitations should be reversed. To the extent that this cannot be done, the Examiner must identify these claim limitations in the record with specificity in order to establish a *prima facie* case of lack of written description so that the Appellant and the Board can address them. This the Examiner has not done. Hence, for this reason alone, the § 112-1 written description rejection of such claim limitations should be reversed.

The remaining category of claim limitations regarding the § 112-1 written description issues are the so-called “interconnections and interrelations” claim limitations. But this is in large part the construction of “interconnections and interrelations” within computer software, such as within “supervisory processor 110R” (Fig. 1A). See, e.g., Section 7.3.15, ; particularly Sections 7.3.15.1, 7.3.15.2, and 7.3.15.6. Further, the Examiner has never attempted to construe such software “interconnections and interrelations”. Hence, for this reason alone, the § 112-1 written description rejection of such “interconnections and interrelations” should be reversed. Further, the disclosure of these claim limitations is shown in Table 5.2 (Section 5.2), thus the § 112-1 written description requirement is satisfied.

It is significant to note that the extensive descriptions related to the occurrences of the sufficiently disclosed claim limitations addressed in Table 5.1 and Table 5.3 (Sections 5.1 and 5.4) provide significant descriptions of the “interconnections and interrelations” for claim construction.

Further, an artisan would be able to provide such “interconnections and interrelations” from the skill in the art, yet the disclosure has extensive guidance regarding the claimed “interconnections and interrelations”. See, e.g.; the top level block diagram (Fig. 1A), the block diagrams detailing the blocks in Fig. 1A (Figs. 1B to 1G), the block diagrams detailing variations of Fig. 1A (Figs. 1H to 1J, 1L, 1P, 6A), the table detailing the blocks in Fig. 1A (Spec. at 24-30), the discussion detailing the blocks in Fig. 1A (Spec. at 5-10, 16-23), and most of the rest of the extensive disclosure provides additional details regarding the implementation and interconnection of these features.

In view of the above, a proper construction of the claim limitations in view of the extensive disclosure would have shown the Examiner that the § 112-1 written description requirement is more than satisfied by the “intrinsic” evidence. Hence, § 112-1 written description rejections fail to establish a prima facie case because of the failure of the Examiner to properly consider the disclosure and because of the failure of the Examiner to properly construe the claims. Hence, the § 112-1 written description rejections should be reversed.

7.4.5 The Examiner Erroneously Bases The Written Description Rejections On A Made-Up Requirement For “A Coherent Embodiment” – For This Reason Alone, The Written Description Rejections Must Fall

The Examiner erroneously bases the written description rejections on a made-up requirement for “a coherent embodiment”. However, the Examiner has cited no authorities and the Appellant knows of none to support a requirement for “a coherent embodiment” (whatever that means). To the contrary, the law is clear on the written description requirements (Section 7.4.2) and the instant claims comply with the law. See also the holdings by the District Court in Hyatt v. Dudas,¹⁸⁸ where the court criticized the use of such “rather vague and unspecific language”:

In this case, the PTO apparently required Hyatt to include a “self-contained embodiment describing each and every limitation of the claim” in his disclosures. *See* 108-F-2,700. It is difficult on this record to

¹⁸⁸ See Hyatt v. Dudas, 1:03-cv-00108 (EGS), MEMORANDUM OPINION (Document 75) at p. 19 (D.D.C. October 13, 2005).

determine what the PTO meant by a “self-contained embodiment,” or whether this requirement is consistent with the case law, because the phrase is not defined nor does it appear in any of the cases. Moreover, in rejecting plaintiff's applications, the PTO at times used rather vague and unspecific language.

For this reason alone, the written description rejections must fall. This despite the fact that the disclosure provides such “a self-contained embodiment” (Section 5.6). For this additional reason, the written description rejections must fall. See the following examples of the Examiner's “self-contained embodiment” statements.

The Examiner uses such “rather vague and unspecific language” (instant Action at 6, 7, 14, 16, 17, 24, and 29; respectively (emphasis in original) (bold underlined emphasis added)):

The specification is a description of several optional architectures (e.g., Figures 1A-1D and 1F-1O), each architecture having numerous optional inputs, supervisory functions, geometric processing capabilities, spatial processing capabilities, multiplexing capabilities, and outputs (e.g., the tables at specification pages 24-30 describe many of these options), with miscellaneous descriptions of image processing operations scattered throughout (and not seemingly related to each other). *The specification lacks coherent embodiments and cohesive descriptions that tie the architecture, hardware options and/or miscellaneous processing descriptions together in a manner that describes the claimed inventions.* This is the primary basis for the written description rejections advanced herein.

Again, the issue is the lack of coherent embodiments and cohesive descriptions that tie one or more of these architectures to the numerous hardware options and miscellaneous processing descriptions discussed below.

In order to determine whether the claims have adequate support, the examiner has read the originally filed disclosure looking for coherent embodiments, or any type of guidance or cohesion that (while not exactly) at least reasonably convey to one skilled in the art that the applicant had possession of the now claimed inventions.

In order to determine whether, and where written description support for the example claim exists, the examiner is looking to the original disclosure for:

- A **coherent embodiment** that describes [sic] the entire combination of claimed elements, along with the interconnections and interrelations between them

The specification was read for any **coherent or even partial embodiment** (with suggestions, or guides) that describes the structure and functional interconnections and interrelations of the example claim. The examiner could not find a coherent description of the complete set of operations required by the claim. Likewise, the examiner could not find a partial embodiment with cohesive suggestions, or guides to other embodiments that would, together, describe the claimed invention.

In summary, upon a thorough reading the applicant's specification from the standpoint of one with no foreknowledge of the now claimed invention, the examiner did not find:

- A **coherent embodiment** that describes [sic] the entire combination of claimed elements, along with the interconnections and interrelations between them

The applicant need only point to a coherent embodiment of the specification that discloses the entire claimed invention, including all of the elements and interrelations between the elements, using words, structures, figures, diagrams and formulas. In the absence of this, the applicant may point to the guides that would lead to a combination of a disclosed hardware configuration, with a particular set of disclosed input, processing and output options, that ties together the disparately disclosed image processing operations in the manner claimed; and without foreknowledge of the now claimed invention and without relying obviousness.

However, the law on written description (Section 7.4.2) does not even mention, much less require, “a coherent embodiment”. See the holdings by the District Court in Hyatt v. Dudas above.

The Examiner makes the following requirement (instant Action at 6):

The specification lacks coherent embodiments and cohesive descriptions that tie the architecture, hardware options and/or miscellaneous processing descriptions together in a manner that describes the claimed inventions

However, this is not the law. The law on written description condones inventions in arts that do not even have “interrelations between the elements”, such as the computer software art. Although the instant claims are, in significant part, directed to computer operations, the Examiner misrepresents the law regarding computer and software inventions and the Examiner misrepresents the instant disclosure which is directed to a computer system with extensive software (e.g.; computer source code and verbal flow chart) disclosure.

The Examiner states (instant Action at 17 and 29; respectively (bold emphasis in original) (bold underline emphasis added)):

Finally, with the above search for coherent or partial embodiments exhausted, the specification was read for the individual image processing operations pertaining to the individual claim elements. Many of the individual operations can be found in disparate sections of the specification, but having no apparent relationship with one another; at least without the claim as a guide.

The applicant need only point to a coherent embodiment of the specification that discloses the entire claimed invention, including all of the elements and interrelations between the elements, using words, structures, figures, diagrams and formulas. In the absence of this, the applicant may point to the guides that would lead to a combination of a disclosed hardware configuration, with a particular set of disclosed input, processing and output options, that ties together the disparately disclosed image processing operations in the manner claimed; and without foreknowledge of the now claimed invention and without relying obviousness.

However, this is a misrepresentation of the claims and the disclosure. First, the process claims do not recite such “claimed elements” (Section 7.3.5.3). Second, the subject sections are not “disparate sections” – they are part of an integrated top-down end-to-end disclosure (Section 5.6). Third, the disclosure includes “a coherent embodiment” (discussed in this section and in Section 5.6) even though it is not required or even suggested by the Federal Circuit.

As discussed above, Judge Radar stated in his concurring opinion in Alappat.¹⁸⁹

The Supreme Court has frequently cautioned that “courts should not read into the patent laws limitations and conditions which the legislature has not expressed.”...This same counsel applies to the Board.

Clearly, the Examiner is prohibited from making up his own written description requirements. Thus, for this reason alone, the written description rejections should be reversed.

7.4.6 The Examiner Makes Other Erroneous Statements Regarding The Written Description Rejections

The Examiner makes many other erroneous statements regarding the written description rejections (instant Action at 6):

The disclosed invention appears to be several generalized image processing architectures having numerous optional capabilities. The specification is a description of several optional architectures (e.g., Figures 1A-1D and 1F-10), each architecture having numerous optional inputs, supervisory functions, geometric processing capabilities, spatial processing capabilities, multiplexing capabilities, and outputs (e.g., the tables at specification pages 24-30 describe many of these options), with miscellaneous descriptions of image processing operations scattered throughout (and not seemingly related to each other). *The specification lacks coherent embodiments and cohesive descriptions that tie the architecture, hardware options and/or miscellaneous processing descriptions together in a manner that describes the claimed inventions.* This is the primary basis for the written description rejections advanced herein.

However, the Examiner again misrepresents the law. Such a requirement for “coherent embodiments and cohesive descriptions” is improper (Section 7.3.4). Further, the disclosure of alternative embodiments does not detract from written description but enhances written description and is condoned, if not implicitly required, by the courts (Sections 7.3.12.1 and 7.3.12.4). Further, much of

¹⁸⁹ In re Alappat, 33 F.3d 1526, 31 USPQ2d 1545, 1591 (Fed. Cir. 1994).

this cited disclosure is expressly disclosed as being included in a single “self-contained” embodiment (Section 5.6).

Regarding the Examiner’s statement “miscellaneous descriptions of image processing operations scattered throughout (and not seemingly related to each other)”, the Examiner again misrepresents the disclosure and the law on written description. In effect, the Examiner is criticizing the instant top-down disclosure, but this is what an artisan would expect. Complex computer systems of necessity are often disclosed in a top-down format where different sections directed to different features of the same system and directed to alternate or optional features of the same system are located at different places in the description. See, e.g. the Table of Contents (Section 9.1).

The Examiner states (instant Action at 6 (emphasis in original)):

The specification lacks coherent embodiments and cohesive descriptions that tie the architecture, hardware options and/or miscellaneous processing descriptions together in a manner that describes the claimed inventions.

However, the Examiner again misrepresents the disclosure. See the discussion of the Fig. 1A embodiment and the claim reading thereon (e.g.; Section 5.1) and the interconnections in the Fig. 1A embodiment and the claim reading thereon (e.g.; Section 5.2).

Regarding the Examiner’s statement “[t]his is the primary basis for the written description rejections advanced herein”; the written description rejections must fall because this “basis for the written description rejections” is wrong as a matter of law and as a matter of fact.

The Examiner states (instant Action at 10 and 11):

Furthermore, few if any of the miscellaneous image processing operations or capabilities described in the specification are linked to any of the specific architectures, or any particular set of hardware/processing options within the architectures.

Again, the specification is a mixing bowl of architectures, options, and miscellaneous image processing functions that lacks coherent embodiments and cohesive descriptions that tie them together; especially in a manner that describes the claimed inventions. It is the examiner’s contention that such a collection of possibilities and capabilities does not necessarily put the applicant in possession of a very specific claim that tie these “capabilities” together as a complete system.

However, this too is a misrepresentation of the disclosure. The Board is referred to the discussions herein regarding the Fig. 1A embodiment and the “experimental system” embodiment (Section 5).

The Examiner states (instant Action at 29):

Furthermore, to date the applicant has made absolutely no attempt to show possession of the claimed invention

However, this too is a misrepresentation. The record shows that the Appellant adequately addressed the written description rejection. Furthermore, this statement indicates that the Examiner disregarded the substance of the extensive disclosure because the disclosure is in itself the best showing of written description. Further, this statement indicates that the Examiner disregarded the Appellant’s substantial arguments regarding § 112-1 in the record. Thus, the Examiner could not possibly have established a prima facie case for the § 112-1 rejections.

The CCPA in Angstadt held that the written description requirement is relatively simple to comply with.¹⁹⁰

Two of the first paragraph requirements indicated above, i.e., the “description of the invention” and the “best mode” requirements, are relatively simple to comply with and thus will ordinarily demand minimal concern on the part of the Patent Office * * * What is of maximum concern in any analysis of whether a particular claim is supported by the disclosure in an application is whether that disclosure contains sufficient teaching regarding the subject matter of the claims as to enable one skilled in the pertinent art to make and use the claimed invention.

Even though the CCPA has told the PTO that the written description requirement is “relatively simple to comply with and thus will ordinarily demand minimal concern on the part of the Patent Office” (see Angstadt), the Examiner disregards this judicial directive – simplicity of compliance. This notwithstanding the fact that the instant disclosure contains hundreds of occurrences of claim limitations (Section 5.4).

¹⁹⁰ In re Angstadt and Griffin, 537 F.2d 498, 190 USPQ 214, 217 (CCPA 1976) (emphasis added).

7.4.7 Claim Terminology Does Not Have To Be Stated Verbatim To Satisfy The Written Description Requirement

The Examiner apparently requires that the claim language have verbatim basis in the disclosure even though such a requirement violates the law. Notwithstanding the fact that there is significant verbatim and literal disclosure of the claim terminology in the instant disclosure, it is not necessary that the application recite the claim limitations exactly.

2163.02 Standard for Determining Compliance With the Written Description Requirement

* * *

The subject matter of the claim need not be described literally (i.e., using the same terms or in haec verba) in order for the disclosure to satisfy the description requirement.

MPEP 2163.02. See also Kayton¹⁹¹:

Where the language of the claims is descriptively supported either in a drawing or, for example, as the cumulative effect of numerous specific embodiments described in the application, it is not necessary that the specific language used as a definition in the claim also be used in the specification as originally filed.

See also Smythe.¹⁹²

The Examiner violates the in banc law of the CCPA and the law of the Federal Circuit:

The function of the description requirement is to ensure that the inventor had possession of, as of the filing date of the application relied upon, the specific subject matter later claimed by him; **how the specification accomplishes this is not material.** In re Smith, 481 F.2d 910, 178 USPQ 620 (CCPA 1973). The claimed subject matter need not be described in haec verba to satisfy the description requirement. In re Smith, 59 CCPA 1025, 458 F.2d 1389, 173 USPQ 679 (CCPA 1972). It is not necessary that the application describe the claim limitations exactly, but only so clearly that one having ordinary skill in the pertinent art would recognize from the disclosure that appellants invented processes including those limitations. In re Smythe, 480 F.2d 1376, 178 USPQ 279 (CCPA 1973).

¹⁹¹ Kayton, I., Patent Practice, Fifth Edition, Vol. 3, Chapter 11, page 92 (Patent Resources Institute, 1993).

¹⁹² In re Smythe, 480 F.2d 1376, 178 USPQ 279 (CCPA 1973).

Herschler.¹⁹³ Notwithstanding the fact that the disclosure has extensive literal support for the claimed invention, such literal support is not required for written description:

Compliance with the written description requirement of Section 112 only requires that appellant's application contain sufficient disclosure, **expressly or inherently**, to make it clear to persons skilled in the art that appellant possessed the subject matter claimed. In re Mott, 539 F.2d 1291, 190 USPQ 536, 541 (CCPA 1976). The test for determining compliance with the written description requirement is whether the disclosure of the application as originally filed reasonably conveys to the artisan that the inventor had possession of the claimed subject matter, **rather than the presence or absence of literal support in the specification for the claim language**. In re Kaslow, 707 F.2d 1366, 217 USPQ 1089, 1096 (Fed. Cir. 1983).

Harvey.¹⁹⁴ Thus, no particular language is required and no literal language support is necessary for the claim language to meet the written description requirement. Hence, the instant disclosure, which has extensive support for the claim limitations (Section 5.1), is certainly adequate to comply with the true § 112-1 written description requirement.

Furthermore, the drawings may be used to support the written description requirement.¹⁹⁵ Nevertheless, the § 112-1 written description rejection does not properly address the extensive disclosure in the drawings.

In view of the above, the Examiner uses the wrong legal basis to support the § 112-1 written description rejection by apparently requiring verbatim support to satisfy the written description requirement.

¹⁹³ In re Herschler, 591 F.2d 693, 700-01, 200 USPQ 711, 717 (CCPA 1979), (emphasis added).

¹⁹⁴ Ex Parte Harvey, 3 USPQ2d 1626, 1627 (Bd. Pat. App. and Int. 1986) (emphasis added).

¹⁹⁵ The content of the drawing may also be considered in determining compliance with the written description requirement. See In re Barker, 559 F.2d 588, 194 USPQ 470, 474 (CCPA 1977); In re Kaslow, 707 F.2d 1366, 1375, 217 USPQ 1089, 1096 (Fed. Cir. 1983).

7.4.8 The Federal Circuit Analyzes Written Description On An Individual Limitation-By-Limitation Basis In Simple Tabular Form

The Federal Circuit analyzes written description on an individual claim limitation by claim limitation basis in a simple tabular form (see table below). See Union Oil.¹⁹⁶ See also Hunter.¹⁹⁷

Depending upon the facts of each particular case, one may satisfy the written description requirement using, for example, drawings, tables, equations, and formulas, alone or in combination.

This tabular form was actually generated by the court in Union Oil:

To reiterate, this court supplies the written description supporting another claim, claim 125 as follows:

What follows this statement in the court decision is another table of the type shown below.

The Federal Circuit even cites to an important limitation from an original claim and combines it with other limitations excerpted from the body of the patent (see table below). It is particularly noteworthy that **this original claim** was previously canceled and **is not in the patent.**¹⁹⁸

The instant disclosure has hundreds of occurrences of claim limitations and discloses thousands relevant interconnections. This is far more than the tables in Union Oil citing to a single recitation in the disclosure for each claim limitation.

| Claim limitation | Support in '393 patent |
|--------------------------------|---|
| T50 at * 200° | Col. 14, ll. 9-15: "no greater than 210° F., . . . <i>but preferably less than 210° F. . . .</i> " |
| RVP at * 7.0 psi | Col. 14, ll. 36-40: "Reid Vapor Pressure specification of 8.0 psi . . . <i>even more preferably no greater than 7.0 psi . . .</i> " |
| Olefin at < 4.0 volume percent | Col. 14, ll. 23-30: "varying the olefin content, this value is generally maintained less than 15 volume percent, with decreasing values providing progressively improved results. Thus, it is contemplated that each unit |

¹⁹⁶ Union Oil Co. of California v. Atlantic Richfield, 208 F.3d 989, 54 USPQ2d 1227, 1233 (Fed. Cir. 2000).

¹⁹⁷ In re Hunter, No. 94-1301, 1995 U.S. App. LEXIS 15363, at *14 (Fed. Cir. June 19, 1995) (emphasis added).

¹⁹⁸ This may be considered to be the intermixing of citations to two separate documents, the original application containing the original claim and the patent to which the other citations are made.

reduction, e.g., to values *below . . . 4 . . . providing progressively better results. . . .*"

Paraffin at > 85

volume percent [sic]

Col. 14, ll. 49-64: "progressively increasing the paraffin content progressively decreases the CO emitted. Accordingly . . . the paraffin content would be increased to . . . and *most preferably of all above 85 volume percent. . . .*"

T90 at * 300°

claimed exactly in original claim 29

T10 at * 158°

Col. 5, lls. 6-30: Table 1 shows maximum T10 distillation temperatures for all five volatility classes at *158 or below*.

Union Oil at 1233 (footnote omitted).

As discussed above, the Federal Circuit confirmed that written description can be satisfied with a table "alone":

Depending upon the facts of each particular case, one may satisfy the written description requirement using, for example, drawings, tables, equations, and formulas, alone or in combination.

Hunter.¹⁹⁹ The Federal Circuit in Union Oil uses a simple tabular method to illustrate written description (see above).

7.4.9 The Product Terminology

7.4.9.1 The § 112-1 Rejections Regarding Product Terminology Are Erroneous In Light Of The Statute And The Law Of The Federal Circuit

The § 112-1 rejections of process claims for reciting "making a product" terminology is prima facie erroneous (instant Action at 25-28. This terminology is statutory language and this terminology is explicitly permitted by the PTO Examination Guidelines. Furthermore, such § 112-1 rejections are in violation of the law of the Federal Circuit. And, notwithstanding the legal impropriety of such § 112-1

¹⁹⁹ In re Hunter, No. 94-1301, 1995 U.S. App. LEXIS 15363, at *14 (Fed. Cir. June 19, 1995) (emphasis added).

rejections, the disclosure provides extensive support for "product" type terminology (Sections 7.4.9.2 and 7.4.9.3).

The plain meaning of making product terminology is clear. Even 35 USC 112-1 recites "the manner and process of **making** and using it [the invention]" (emphasis added). And the invention unquestionably constitutes a product.

There should be no doubt that a patent application discloses a product, as established by Webster's Dictionary:²⁰⁰

"product ... 1. a thing produced by labor 2. a person or thing produced by or resulting from a process"

There should be no doubt that a product is made when practicing the disclosed invention.

The Appellant makes note that various panels of the Board have rendered decisions on such "making a product" type claims in copending applications. Some of these decisions reversed such "making a product" type claims and some of these decisions affirmed such "making a product" type claims. Some of these decisions are now under appeal to the District Court under 35 USC 145.²⁰¹

The Board in a copending application has made relevant decisions. See, e.g., Ex parte Hyatt, Decision on Appeal No. 2002-2032, in patent application Serial No. 08/471,698 (PTO Bd. App. September 30, 2003) (unpublished PTO decision); Ex parte Hyatt, Decision on Rehearing in Appeal No. 2002-2032, in patent application Serial No. 08/471,698 (PTO Bd. App. September 17, 2004) (unpublished PTO decision).

Examiners in other applications have made relevant holdings. See, e.g., the following:

Although neither Westell ('914) nor Boone et al. ('351) disclose the intended use of their systems, and do not specifically provide for making a product and making an information product, the systems disclosed are known to be utilized for such purposes in the prior art.

²⁰⁰ Webster's Encyclopedic Unabridged Dictionary of the English Language 1148 (1989).

²⁰¹ See Hyatt v. Rogan, No. 03-CV-0108 (EGS) (D.D.C.); Hyatt v. Rogan, No. 03-CV-901 (HHK) (D.D.C.); Hyatt v. Dudas, No. 04-CV-1138 (HHK) (D.D.C.); Hyatt v. Dudas, No. 04-CV-1139 (HHK) (D.D.C.); Hyatt v. Dudas, No. 04-CV-1222 (EGS) (D.D.C.); Hyatt v. Dudas, No. 04-CV-1496 (EGS) (D.D.C.); Hyatt v. Dudas, No. 04-CV-1802 (HHK) (D.D.C.); Hyatt v. Dudas, No. 05-CV-309 (EGS) (D.D.C.); and Hyatt v. Dudas, No. 05-CV-310 (HHK) (D.D.C.).

See copending applications.²⁰²

Although Widergren et al. does not disclose the intended use of their systems, and do not specifically provide for making a product and making an information product, the systems disclosed are known to be utilized for such purposes in the prior art.

See copending application.²⁰³

Although the cited references do not disclose the intended use of their systems, and not specifically provide for making a product and making an information product, the systems disclosed are known to be utilized for such purposes in the prior art.

See copending application.²⁰⁴

Given the teachings of the references and the same environment of operation, that of manipulation and displaying of the data thereof, one of ordinary skill in the art at the time the invention was made would have been led in an obvious fashion to provide for making a product ... since the usage of the data processing system for making is well known as evidenced by the Hyatt ('894) system.

See copending applications.²⁰⁵

²⁰² See copending application S/N 08/426,450 in the final Action dated August 17, 1999 at 106; copending application S/N 08/426,521 in the final Action dated August 17, 1999 at 111; copending application S/N 08/426,361 in the final Action dated August 17, 1999 at 86-87; copending application S/N 08/426,554 in the final Action dated August 17, 1999 at 78; and copending application S/N 08/426,549 in the final Action dated August 17, 1999 at 92-93 (emphasis added).

²⁰³ See copending application S/N 08/427,547 in the final Action dated August 17, 1999 at 76 (emphasis added).

²⁰⁴ See copending application S/N 08/428,359 in the final Action dated August 17, 1999 at 76 (emphasis added).

²⁰⁵ See copending application S/N 08/426,450 in the final Action dated August 17, 1999 at 106 and 122; copending application S/N 08/426,754 in the final Action dated August 24, 1999 at 79; copending application S/N 08/426,521 in the final Action dated August 17, 1999 at 111; copending application S/N 08/426,361 in the final Action dated August 17, 1999 at 87 and 97; copending application S/N 08/426,554 in the final Action dated August 17, 1999 at 78; and copending application S/N 08/426,549 in the final Action dated August 17, 1999 at 93; copending application S/N 08/428,359 in the final Action dated August 17, 1999 at 76 and 90; copending application S/N 426,779 in the final Action dated August 17, 1999 at 92-93; and copending application S/N 427,547 in the final Action dated August 17, 1999 at 76 and 90 (emphasis added).

These § 112-1 rejections are in conflict with the statutory language of 35 USC § 271(g) ("§ 271(g)"). This statute expressly provides for protection of a "product" made by a claimed process. The process claims at issue recite the act of making such a "product" in full compliance with the statute.

Section § 271(g) covers "products" made with the claimed process **even without reciting** "product" terminology. Hence, it goes against the clear intent of the statute to reject claims under § 112 for expressly reciting such statutory "product" terminology. If a process claim implicitly covers products made with the process, then it cannot be the law that an applicant cannot expressly claim such covered products.

Furthermore, because the "product" terminology is statutory language in § 271(g), it is improper to require the disclosure to recite this "product" terminology verbatim. Generally, **statutory language is above challenge by the PTO**.

In addition to the § 112-1 rejections being improper because of § 271(g), the § 112-1 rejections are also contradicted by the PTO Examination Guidelines regarding "product" terminology.

Products may be either machines, manufactures or compositions of matter.

A machine is:

a concrete thing, consisting of parts or of certain devices and combinations of devices.

Burr v. Duryee, 68 US (1 Wall.) 531, 570 (1863).

A manufacture is:

the production of articles for use from raw or prepared materials by giving to these material new forms, qualities, properties or combinations, whether by hand-labor or by machinery.

Diamond v. Chakrabarty, 447 US at 308, 206 USPQ at 196-197 (quoting American Fruit Growers, Inc. v. Brogdex Co., 283 US 1, 11 (1931)).

Examination Guidelines.²⁰⁶ See also Harmon²⁰⁷:

The eligible **products** identified in paragraph 101 are machines, manufactures, and compositions of matter.

²⁰⁶ Examination Guidelines For Computer-Related Inventions, 1184 OG 87 at 96, FN 35.

²⁰⁷ Robert L. Harmon, Patents and the Federal Circuit at 27, Second Edition, BNA (1991) (emphasis added).

Clearly, the disclosed apparatuses (e.g., circuits) constitute "machines" and "manufactures" and hence "products". Also, the disclosed signals constitute "manufactures" (and hence "products") because the signals are physical things²⁰⁸ that are made, for example, by the disclosed circuits.

Because statutory categories of patentable subject matter include both processes and products and since products include machines, manufactures, and compositions of matter; there should be no question that claims directed to the acts of a process and further directed to the act of making a product fully comply with 35 USC § 112. Hence, the disclosed apparatuses (e.g., circuits and devices) and the disclosed signals and display images, for example, all constitute **products**.

Furthermore, the instant § 112 rejections regarding "product" terminology are in conflict with the law of the in banc CCPA and thus in conflict with the law of the Federal Circuit.²⁰⁹

The CCPA in Best²¹⁰ established that an invention can be claimed both with a "process" claim and with a "product" claim. Similarly, in the instant application, it is clearly permitted to claim both the process and the further act of making a product in response to the process or as a step in the process. Hence, it is permissible to recite together both a process claim and a process claim which comprises the further act of making a product.

Further, claims reciting "making a product" have been issued in related patent No. 5,584,032²¹¹ (the '032 patent).

In view of the above, the product terminology in the claims is consistent with the statutes, case law, and PTO guidelines. Hence, the § 112-1 rejections regarding product terminology should be reversed.

²⁰⁸ Signals are "necessarily physical." Arrhythmia Research Technology Inc. v. Corazonix Corp., 22 USPQ2d 1033, 1038 (Fed. Cir. 1992). See also In re Taner et. al., 214 USPQ 678 (CCPA 1982); In re Sherwood, 613 F.2d 809, 204 USPQ 537, 545 FN 8 (CCPA 1980); and In re Johnson, 589 F.2d 1070, 200 USPQ 199 (CCPA 1978).

²⁰⁹ The Federal Circuit has adopted the law of the CCPA. See South Corp. v. United States, 690 F.2d 1368, 215 USPQ 657 (Fed. Cir. 1982). Because the CCPA always sat in banc, its decisions will not be overturned by a panel decision of the Federal Circuit. Rather, CCPA decisions can be overturned only by an in banc decision of the Federal Circuit.

²¹⁰ In re Best, Bolton, and Shaw, 562 F.2d 1252, 195 USPQ 430 (CCPA 1977).

²¹¹ See "making a product" claim terminology in claims 32, 34, 40, and 42 of ancestor patent No. 5,584,032. See also "making a product" claim terminology in claims 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, and 64 of Hyatt patent No. 5,615,142.

7.4.9.2 The Instant Disclosure Has Ample Product-Related Antecedent Basis

The instant disclosure is after all an invention of products (e.g., display products, computer system products, and other products). Detailed schematics and descriptions of the products are disclosed. The use of such products in a system (e.g., a display system, a memory system, and other systems) represents system products. The “experimental system” (e.g., pages 240-373) discloses the details of the system products.

The “experimental system” (e.g., pages 240-371) discloses the details of the system products. Various applications of the invention are specifically disclosed in the main sections entitled "DISPLAY APPLICATIONS" having 17 subsections and entitled "NON-DISPLAY APPLICATIONS" having three subsections disclosing different applications listed in the following Table Of Representative Applications Of The Invention.

| <u>TABLE OF REPRESENTATIVE APPLICATIONS OF THE INVENTION</u> | |
|---|-----|
| DISPLAY APPLICATIONS | 439 |
| General | 440 |
| Moving Map Display Application | 444 |
| Informational Database Application | 450 |
| High Definition Television Application | 453 |
| Special Effects Application | 454 |
| Remotely Piloted Vehicle Application | 455 |
| Digital Video Camera Application | 458 |
| Landscape Architecture Application | 460 |
| Video “Photograph” Application | 462 |
| Electronic Puppeteer Application | 464 |
| Flight Simulator Application | 466 |
| Traffic Accident Simulator Application | 467 |
| Train Simulator Application | 469 |
| Helicopter Training Simulator Application | 471 |
| Large Image Applications | 474 |
| Image Processing Workstation Application | 482 |
| Arcade Game Application | 486 |
| NON-DISPLAY APPLICATIONS | 492 |
| General Description | 493 |
| Pattern Recognition | 496 |

The instant application even discloses integrated circuit DIP layouts on the circuit boards (DIP layout, pages 522-543), program listings (pages 544-574), and detailed schematic diagrams (e.g., Figs. 6B-6D and 6F-6AH).

The instant application also recites ample making-related terminology and product-related terminology at numerous locations. See the Table of Product-Related Occurrences.²¹² Further, the figures show and the specification describes circuits, computer listings, and other implementation details. Terms related to implement, construct, configure, insert, plug-in, and practice are recited in the disclosure, as listed in the table below. For example, the term "implement" and terms related thereto are recited more than 400 times in the disclosure.

²¹² Product-related terminology is listed in alphabetical order in the "TERMINOLOGY" column in the Table of Product-Related Occurrences. The number of occurrences in the specification for the term and terms related thereto is identified in the "OCCURRENCES" column. The symbol ">" means "greater than".

TABLE OF PRODUCT- RELATED OCCURRENCES

| <u>TERMINOLOGY</u> | <u>OCCURRENCES</u> |
|---------------------------|---------------------------|
| architecture | >50 |
| arrangement | >100 |
| board | >100 |
| cable | >20 |
| circuit | >50 |
| configure... | >300 |
| connect | >50 |
| construct | >5 |
| design | >15 |
| firmware | >2 |
| hardware | >15 |
| implement | >400 |
| insert... | >10 |
| plug-in | =1 |
| practice | >1 |
| reduction to practice | >1 |
| schematic | >30 |
| software | >10 |
| system | >200 |
| use, used | >100 |
| wire, wire wrap | >10 |

The instant disclosure recites ample product-related terminology. Terms related to implement, construct, configure, insert, interconnect, plug-in, and practice are recited in the disclosure, as discussed below. Further, terms related to displays, signals, information, etc. are also recited in the disclosure.

Representative excerpts from the disclosure are quoted below.

An experimental system has been **constructed** to demonstrate operation of the graphics display capability.

See Spec. at 156 (emphasis added).

The experimental configuration has been **constructed** having a 512-pixel by 512-pixel memory map. For convenience of experimentation, static 16K-RAM chips are used for memory map **implementation**. Typical circuits are the TMS-4016 RAM from Texas Instruments Inc. and the M58725P static RAM from Mitsubishi Electric. These circuits are **configured** in the form of a 2K-word by

8-bit static RAM having an 11-bit address, a tristate chip select, and a tristate output enable. Conventionally, the chip select and output enable are used to provide output bussing and to reduce the need for an output register. In the present configuration, the chip select and output enable signals are used to provide 2-additional dimensions of memory addressing.

See Spec. at 202 (emphasis added).

Each board is constructed with a Vector board, manufactured by Vector Electronic Company of Sylmar CA, having 1/10th inch hole spacings on a 17-inch by 8 1/2-inch board. Wire wrap DIP sockets and cable connectors are inserted into the Vector board and interconnected with wire wrap interconnections. Information on the DIPs plugged-in to the DIP sockets is provided for selected boards in the printout of the TABLE OF DIP LAYOUT ON BOARDS included herewith. Information on the cable connectors is provided for each cable in the printout of the CABLE CONNECTION TABLE included herewith.

See Spec. at 156 (emphasis added).

A discussion will now be provided relative to Figs 6G to 6N to illustrate the logical design of the memory. Figs 6G to 6K each show 16-RAMs organized in 2-logical columns and constructed on one row on a memory board, where each memory board has 4-groups of 16-RAMs each shown in one of Figs 6G to 6J.

See Spec. at 331 (emphasis added).

The experimental configuration has been constructed having a 512-pixel by 512-pixel memory map.

See Spec. at 202 (emphasis added).

Operation of hardware and software in the experimental system discussed herein in conjunction with a color monitor demonstrates operation of the system, meeting of system objectives, and providing actual reduction to practice. For example, information has been loaded into image memory and has been display processed and displayed to demonstrate operation.

See Spec. at 242 (emphasis added).

A product-related excerpt regarding the experimental system is quoted below.

Circuit Boards

The experimental system is **implemented with wire wrap circuit boards** consisting of 2-Memory Boards (BM1 and BM2), 1-Logic Board (BL1), 1-Buffer Board (BB1), and 1-Rear End Board (BR1). Each board is **constructed** with a Vector board, manufactured by Vector Electronic Company of Sylmar CA, having 1/10th inch hole spacings on a 17-inch by 8 1/2 -inch board. Wire wrap DIP sockets and cable connectors are **inserted into the Vector board and interconnected with wire wrap interconnections**. Information on the DIPs plugged-in to the DIP sockets is provided for selected boards in the printout of the TABLE OF DIP LAYOUT ON BOARDS included herewith. Information on the cable connectors is provided for each cable in the printout of the CABLE CONNECTION TABLE included herewith.

DIP assignments are provided for selected boards in the TABLE OF DIP LAYOUT ON BOARDS included herewith, for each board. DIPs are arranged on the boards as rows identified with alphabetical symbols; i.e., A to E; and as columns identified with numerical symbols; i.e., 1 to 23. Each DIP position on a board is identified with a U symbol followed by the column and row symbols (i.e., U3A).

Logical schematic diagrams showing implementation of the experimental system are provided herewith, such as shown in Fig 6. These logical diagrams show standard commercially available integrated circuits; such as TTL series 7400 ICs, Mitsubishi M58725 RAMs, and 8216 bi-directional bus drivers, and Sygnetics 8T97 buffers. Specifications for these integrated circuits are available in catalogs and specification sheets from the abovementioned manufacturers and are well known in the art.

The **schematic diagrams** show the logical function in symbolic form, identify the type of IC, identify the DIP numbers and pin numbers, and show wiring interconnections between DIP and pin numbers. Device types are often shortened, such as shortening the name 74LS02 to LS02. DIP assignments are identified with U numbers, such as U20C representing the DIP at row-20 column-C on the subject circuit board. For example, a NOR-gate is shown at the top portion of Fig 6B identified with the designation LS02 as being a 74LS02 quad NOR-gate integrated circuit, identified with the designation U21C as being located on the BL1 circuit board at row-C column-21, and having

2-input signals on pin-11 and pin-12 of the DIP and one output signal on pin-13 of the DIP. The input to pin-11 is shown connected to the output of DIP U22B pin-3, the input to pin-12 is shown connected to the output of DIP U20B pin-12, and the output from pin-13 is shown connected to DIP U7D pin-9. For convenience of documentation, interconnections may be designated by the DIP identification number and pin number separated by a dash; i.e., U21C- 13 representing pin-13 of DIP U21C. For convenience of discussion, logical circuits may be designated by the DIP identification number and the output pin number separated by a dash; i.e., U21C-13 representing pin-13 of DIP U21C.

Cable List

A cable list is provided in the CABLE CONNECTION TABLE included herewith. This cable list identifies the cables between the various Vector boards and between the Vector boards and the supervisory processor. Each cable between display processor boards is implemented with a 50-pin ribbon cable having odd pins connected to ground for signal isolation. Each cable between the Vector boards and the supervisory processor is implemented with an RS-232 type 25-pin ribbon cable, consistent with the signal representations for the Compupro Interfacer- II board. The cable list identifies the pin associated with a signal, a symbol associated with the signal, a description of the signal, a representative source of the signal and a representative destination of the signal.

S-100 Bus System

The experimental system has been implemented with an S-100 bus based system performing supervisory processor functions in conjunction with the novel software and hardware, as discussed herein. Two S-100 bus based systems have been configured, the Camille system and the Murphy system. The configuration of the Camille system will be discussed in detail hereinafter. The Camille system comprises a computer, a pair of floppy disk drives, a terminal, and printers as discussed below.

The floppy disk drives are implemented with a pair of 8-inch disk drives in an enclosure and operating in conjunction with a DMA controller in the computer. The disk drives are manufactured by Siemens as the FDD 100-8; the drive enclosure is manufactured by International Instrumentation, Incorporated; and the DMA Controller is manufactured by CompuPro as the Disk 1 DMA Controller; all described in detail in the referenced manuals.

The terminal is manufactured by Applied Digital Data Systems, Inc. (ADDS) as the Model Viewpoint/3A Plus; described in detail in the referenced manual.

The printers include a dot matrix printer manufactured by Star Micronics, Inc. as the Gemini-10, a dot matrix printer manufactured by Epson as the FX-100, and a daisywheel printer manufactured by Smith-Corona as the TP-I; all described in detail in the referenced manuals.

The computer is implemented with a cabinet manufactured by Fulcrum Computer Products as the I8080 Microcomputer System Cabinet and having a backplane S-100 board manufactured by CPA which is described in detail in the referenced CPA manual.

The computer is implemented with various S-100 boards manufactured by CompuPro including the 8085-8088 CPU board, RAM 16 and RAM 17 memory boards, a System Support board, and a pair of Interfacer 2 boards. One Interfacer 2 board is used to interface to the terminal and printers. The other Interfacer 2 board provides the 3-channel parallel interface to the control logic. These boards are described in detail in the referenced manuals.

The joysticks are implemented with the Computer Compatible Joystick; described in the referenced applications notes.

The operating system is CP/M 80, which is described in detail in the referenced documents.

The applications program runs under Basic, which is described in detail in the referenced documents.

The following documents provide supplemental data on the computer system and are herein incorporated by reference.

1. Technical Manual, Siemens, OEM Floppy Disk Drive FDD 100-8, Technical Manual, Model 100-80.
2. Manual, International Instrumentation, Incorporated, Universal Disk Enclosures, General Information/Pricing, 1982.
3. User Manual, CompuPro Division of Godbout Electronics, Disk 1 Arbitrated 24 Bit DMA Floppy Disk Controller, 1981.
4. User's Manual, Applied Digital Data Systems, Inc., Viewpoint/3A Plus, 518-31100.
5. Operation Manual, Star Micronics, Inc., Gemini-10.
6. Operation Manual, Epson, FX Printer, 1983.
7. Operator's Manual, Smith-Corona, TP-I.
8. Functional Description, CP-A, Revision 1.
9. Technical Manual, CompuPro Division of Godbout Electronics, 8085/8088 CPU Dual CPU, 2/83.

10. Technical Manual, CompuPro Division of Godbout Electronics, RAM 16 Static Memory, 4/82.
11. Technical Manual, CompuPro Division of Godbout Electronics, RAM 17 64K Static Memory, 9/82.
12. User's Manual, CompuPro Division of Godbout Electronics, System Support 1, 8/81.
13. Technical Manual, CompuPro Division of Godbout Electronics, Interfacer 2,4/82.
14. The CP/M Handbook with MP/M, by Rodney Zaks, published by Sybex, 1980.
15. CP/M Primer, by Stephen Murtha and Mitchell Waite, published by Howard W. Sams & Co., Inc., 1980.
16. An Introduction to CP/M Features and Facilities, published by Digital Research, January 1978.
17. Microsoft Basic Reference Book, published by Microsoft, 1979.
18. Microsoft Basic Compiler Documentation, published by Microsoft.
19. The Basic Handbook (2nd Edition), by David Lien, published by Compusoft Publishing, 1981.
20. Microsoft Basic (2nd Edition), by Ken Knecht, published by Dilithium Press, 1983.
21. Basic Basic (2nd Edition), by James Coan, published by Hayden Book Company, Inc., 1978.
22. Computer Compatible Joystick Instruction, applicable to: Apple-II.

See Spec. at 293-299 (emphasis added).

In view of the above, the disclosure has numerous recitations of making-related terminology and product-related terminology that establishes written description for "making a product" claim limitations and the disclosure has extensive details that constitutes enablement of "making a product" claim limitations. Hence, the § 112 rejections regarding "making a product" claim terminology should be reversed.

7.4.9.3 The Product Terminology Has Further Antecedent Basis In The Disclosures Of Ancestor Patents That Are Expressly Incorporated-By-Reference

The instant application incorporates-by-reference ancestor patents which have product-related disclosures. For example, the instant application incorporates-by-reference ancestor patent No.

4,209,843 (the "'843 patent") having product-related terminology. Productivity is literally disclosed in the '843 patent, where such "productivity" pertains to a **product**.²¹³

As defined by Webster's Dictionary, "productivity" pertains to **producing goods and services** and producing goods and services is synonymous with "making a product"²¹⁴

pro.duc.tive ... 4. Econ. producing or tending to produce goods and services having exchange value,

In the instant application, this productivity is the productivity of the system product (e.g., an image information wrap-around system product).

Other ancestor applications have other product related disclosures. See, e.g., the Board decisions in copending applications cited to in Section 7.4.9.1 and the common ancestor applications between those applications and the instant application.

²¹³ The following table provides a list of citations to application S/N 05/550,231 (which issued as the '843 patent) regarding productivity:

| <u>DESCRIPTION OF "MAKING A PRODUCT"</u> | | | |
|--|--------------------|--------------------|--------------------|
| <u>PAGE: LINES</u> | <u>PAGE: LINES</u> | <u>PAGE: LINES</u> | <u>PAGE: LINES</u> |
| 15:1-24 | 45:28-31 | 312:9-16 | 333:20-25 |
| 16:6-20 | 97:24-27 | 314:3-9 | 435:1-4 |
| 17:21-28 | 300:15-16 | 321:9-19 | 436:6-12 |
| 18:18-30 | 301:28-36 | 322:2-5 | 436:20-24 |
| 19:7-9 | 306:1-8 | 322:21-323:12 | |

²¹⁴ Webster's Encyclopedic Unabridged Dictionary of the English Language 1148 (1989).

7.5 THE 35 USC § 112-1 ENABLEMENT REJECTIONS

7.5.1 Introduction

The Appellant traverses the § 112-1 enablement rejections. The § 112-1 enablement rejections are based on erroneous and conclusory statements which violate the law of the Federal Circuit. “[W]e review the Board’s underlying factual findings for substantial evidence Broad conclusory statements standing alone are not “evidence”.”²¹⁵ Consequently, the § 112-1 enablement rejections must fall. Further, the Examiner has improperly grouped the claims together in a common § 112-1 enablement rejections based upon a so-called “example” claim (Sections 5.5 and 7.3.5.2) and hence fails to establish a prima facie case of lack of enablement under § 112-1.

The § 112-1 rejections do not, and in fact cannot,²¹⁶ establish a prima facie case of lack of enablement.

The Appellant respectfully traverses the § 112-1 enablement rejections for the reasons discussed in Sections 7.3 and 7.5.2 et seq.

7.5.2 The Established Law On Enablement

It is black-letter law that the test for enablement is whether there is “undue experimentation” to make and use the claimed invention and it is black-letter law that the disclosure can rely on the skill in the art.

The test of enablement is whether one reasonably skilled in the art could make or use the Invention from the disclosures in the patent coupled with information known in the art without undue experimentation.

US v. Telectronics.²¹⁷

²¹⁵ In re Kotzab, 55 USPQ2d 1313, 1316-17 (Fed. Cir. 2000).

²¹⁶ The Examiner cannot establish a prima facie case of lack of enablement because the claims find ample antecedent basis in the extensive and detailed disclosure.

²¹⁷ United States v. Telectronics, Inc., 857 F.2d 778, 785, 8 USPQ2d 1217, 1223 (Fed. Cir. 1988).

According to the law on experimentation (Section 7.5.8.2), there is **no experimentation** needed to enable the instant claimed invention, this notwithstanding the established fact that reasonable experimentation is permissible. Taken separately, (a) the high skill in the computer and programming arts and the high predictability in the electronics, programming, and computer arts (Section 7.5.6.1) and (b) the extensive disclosure (including the disclosed actually reduced-to-practice “experimental system”), each by itself facilitates enablement. Yet, the Appellant is permitted to rely on both, the high skill in the art and his own extensive and detailed disclosure.

Moreover, the Examiner has not established why an artisan would not be able to make and use the claimed invention in view of the high skill in the art and the extensive disclosure (e.g.; Sections 7.5.6.1 and 5).

It is particularly important that the Examiner uses conclusory cliches about “undue experimentation” to attempt to support the enablement rejections, but he makes no effort to cite to any law on what “undue experimentation” means. This is because the law on experimentation (Section 7.5.8.2) is fatal to the enablement rejections.

The MPEP confirms that “[s]oftware aspects of inventions may be described functionally”.²¹⁸

The claimed invention subject matter need not be described literally, i.e., using the same terms, in order for the disclosure to satisfy the description requirement. Software aspects of inventions may be described functionally. See *Robotic Vision Sys. v. View Eng'g, Inc.*, 112 F.3d 1163, 1166, 42 USPQ2d 1619, 1622-23 (Fed. Cir. 1997); *Fonar Corp. v. General Electric Co.*, 107 F.3d 1543, 1549, 41 USPQ2d 1801, 1805 (Fed. Cir. 1997); *In re Hayes Microcomputer Prods., Inc.*, 982 F.2d 1527, 1537-38, 25 USPQ2d 1241, 1248-49 (Fed. Cir. 1992).

It follows that the functional disclosure of software aspects of inventions are also suitable for enablement. However, the Examiner misrepresents the extensive functional disclosures of the “[s]oftware aspects” in the instant disclosure.

The CCPA in Sherwood established that “the touchstone [for § 112-1] is the content, not the form”, and that § 112-1 can even be satisfied with a “verbal flow chart” (e.g.; Section 7.5.6.1).²¹⁹ See

²¹⁸ MPEP at § 2106, in discussing compliance with the written description requirement at B.1. (pp. 2100-20; Revision 2, May 2004).

also Section 7.3.11 for a discussion of software disclosure. This despite the extensive apparatus disclosure in the application.

Further, the Examiner has failed to do a proper analysis according to Wands²²⁰ (Section 7.5.9). For example, the Examiner misrepresents the skill in the art, disregards the extensive disclosure of “working examples”, and disregards the law on “experimentation”; all of which are critical to a Wands analysis. Further, the Federal Circuit requires the Examiner to construe the rejected claims. How else can the Examiner evaluate enablement? However, the Examiner has not properly construed the rejected claims (Section 7.2.6). Hence, for these reasons alone, the § 112-1 enablement rejections should be reversed.

The failure to properly consider the skill in the art is fatal to the § 112-1 enablement rejections. The U.S. Supreme Court requires the Examiner to treat knowledge which is common and well known as if it were written out in the patent and delineated in the drawings, but the Examiner has failed to do so:

He [an engineer] may begin at the point where his invention begins, and describe what he has made that is new, and what it replaces of the old. **That which is common and well known is as if it were written out in the patent and delineated in the drawings.**

Loom.²²¹ The Federal Circuit in Atmel reiterates the law of the U.S. Supreme Court:²²²

Paragraph 1 permits resort to material outside of the specification in order to satisfy the enablement portion of the statute because **it makes no sense to encumber the specification of a patent with all the knowledge of the past concerning how to make and use the claimed invention.** One skilled in the art knows how to make and use a bolt, a wheel, a gear, a transistor, or a known chemical starting material. The specification would be of enormous and unnecessary length if one had to literally reinvent and describe the wheel.

²¹⁹ In Re Sherwood, 613 F.2d 809, 204 USPQ 537, 544-545 n.8 (CCPA 1980).

²²⁰ In re Wands, 858 F.2d 731, 8 USPQ2d 1400 (Fed. Cir. 1988).

²²¹ Loom Co. v. Higgins, 105 U.S. 580, 585 (1881) (emphasis added).

²²² Atmel Corp. v. Info. Storage Devices, Inc., 198 F.3d 1374, 53 USPQ2d 1225, 1230 (Fed. Cir. 1999) (emphasis added).

The Federal Circuit requires the Examiner to consider the disclosure as a whole in order to evaluate enablement.

Thus, the examiner and the board effectively ignored statement [D] and the rest of the disclosure. This was error because the specification disclosure *as a whole* must be considered. *In re Moore, supra*.

The PTO not having carried its burden of establishing lack of enablement, this rejection of claim 14 under § 112, first paragraph, is reversed.

Hogan.²²³ However, the Examiner has not considered the disclosure as a whole in the instant application. For example, the Examiner does not properly consider and the Examiner misrepresents the disclosed self-contained embodiment (e.g.; Section 5.6), the top-down end-to-end disclosure (e.g.; Section 5.6), and the actually reduced-to-practice “experimental system” (e.g.; Sections 5.7 and 7.3.10).

Thus, the § 112-1 enablement rejections are fatally defective and should be reversed.

7.5.3 The Examiner Did Not Even Get Started On His § 112-1 Examination According To The Courts And The PTO

The Examiner did not even get started on his § 112-1 examination according to the courts and the PTO.

According to the PTO, the starting point must be the “working example” and the Examiner “**must**” then “extrapolate” from the working example “across the entire scope of the claims” (see below). However, the Examiner did not properly consider the many disclosed “working examples” (Sections 7.5.10). Hence, the Examiner could not possibly have started with the “working examples” as required and he certainly could not have extrapolated from the “working examples” “across the entire scope of the claims” as further required. See MPEP 2164.02:

To make a valid rejection, one must evaluate all the facts and evidence and state why one would not expect to be able to extrapolate that one example across the entire scope of the claims.

²²³ In re Hogan, 559 F.2d 595, 194 USPQ 527, 539 (CCPA 1977).

This requirement is supported by the courts (discussed below).²²⁴ The starting point (the “outset”) in this case is the instant disclosure includes the disclosed actually reduced-to-practice “experimental system” (Sections 5.7 and 7.3.10), the top-down end-to-end disclosure (e.g.; Section 5.6), and the self-contained embodiment (e.g.; Section 5.6). From this starting point, the Examiner “**must**” establish “some technical uncertainty” *infra*. However, as discussed above, the Examiner never got to the starting point, never properly evaluated the disclosed actually reduced-to-practice “experimental system” and the self-contained embodiment, and never established any “technical uncertainty” starting with the disclosed actually reduced-to-practice “experimental system” and the self-contained embodiment.

The court in United Stationers stated.²²⁵

H.R. Conf. Rep. No. 99-841, at II-72 (1986).... The Report suggests that qualifying research **must from its outset involve some technical uncertainty** about the possibility of developing the product. See *Norwest*, 1998 U.S. Tax Ct. LEXIS 32, P 52,758, at 4655 (discussing the “required uncertainty”); cf. *TSR*, 96 T.C. at 920-21.

However, the Examiner has not established “some technical uncertainty about the possibility of developing the product” – which is the making or using of the invention. This is not surprising – what could the Examiner say about a technical uncertainty of making or using a disclosed computer, or making or using disclosed software, or making and using a disclosed computer memory particularly when the disclosed actually reduced-to-practice “experimental system” had already been developed, was disclosed in great detail, and was the starting point – the “outset”.

According to the Federal Circuit, the starting point must also include construing the rejected claims, but the Examiner has not properly construed the rejected claims (Section 7.2.6). For example, in Gechter, Judge Michel clarified claim construction:²²⁶

Implicit in our review of the Board’s anticipation analysis [and any other patentability analysis] is that the claim **must first have been correctly**

²²⁴ Norwest Corporation and Subsidiaries v. Commissioner of Internal Revenue, 110 TC 454, 507-508 (1998); WICOR, Inc. and Subsidiaries v. United States, 116 F. Supp. 2d 1028, 1035-36 (E.D. Wis. 2000); United Stationers, Inc. v. United States, 163 F.3d 440, 445-46 (7th Cir. 1998).

²²⁵ United Stationers, Inc. v. United States, 163 F.3d 440, 446 (7th Cir. 1998) (emphasis added).

²²⁶ Gechter v. Davidson, 116 F.3d 1454, 43 USPQ2d 1030, 1032 (Fed. Cir. 1997) (emphasis added).

construed to define the scope and meaning of each contested limitation.

In view of the above, the Examiner did not even get started on his § 112-1 examination. Hence, the § 112-1 rejections should be reversed.

7.5.4 The Disclosure Makes Extensive Use Of Commercially Available Products And IC Components

The description and the figures include extensive disclosure of commercially available products and components, such as commercially available IC components. The disclosure provides extensive details, including schematic diagrams down to the individual component and individual wire level of detail (e.g.; Sections 5.7 and 7.5.5).

The Motorola Schottky TTL Data book is a 500-plus page data book on integrated circuit components. "TTL" is a well known acronym for Transistor Transistor Logic (TTL) integrated circuit components. The Motorola Schottky TTL Data book includes extensive design detail, schematic diagrams of the IC components, operating parameters, parametric design charts, pin designations, design details, descriptions of the integrated circuits, and significant other design details. The disclosure includes the widely used series 7400 line of commercially available TTL ICs (Motorola Schottky TTL Data book at 1-2 (Section 9.4 herein) (emphasis added)):

TTL in Perspective

Since its introduction, TTL has become the most popular digital logic family.... The popularity of TTL stems from its ease of use, low cost, medium-to-high speed operation, and good output drive capability.

The disclosure identifies IC components by serial number and by schematic symbols (See, e.g., Figs. 6B-6D) consistent with the serial numbers and schematic symbols used in the Motorola Schottky TTL Data book. See, e.g., the Motorola Schottky TTL Data book (Section 9.4 herein).

The disclosure expressly **incorporates by reference** various IC design books, including the Motorola Schottky TTL Data book.

The circuits used in the experimental system are generally commercially available circuits and are well known For example, the 74LS00,

74ALS00, and 74AS00 specification are set forth in the referenced Texas Instrument and Motorola catalogs ...; which are herein **incorporated by reference**....

6. Motorola, Schottky TTL Databook, 1981.

See Spec. at 312 (emphasis added). Excerpts from the Motorola Schottky TTL Data book are attached hereto in Section 9.4. The disclosure identifies IC components by serial numbers and schematic symbols including the pin numbers for the components.

The use of and disclosure of commercial ICs mounted and interconnected on circuit boards is clearly described in the specification, as discussed below, even to the level of cable lists, circuit placement, and software listings, as discussed below.

CIRCUIT SPECIFICATIONS

The circuits used in the experimental system are generally commercially available circuits that are well known and that are described in widely distributed specification sheets and component catalogs. A list of these specification sheets and catalogs is provided hereinafter and the materials referenced therein are incorporated herein by reference. For example, the 74LS00, 74ALS00, and 74AS00 specifications are set forth in the referenced Texas Instruments and Motorola catalogs and the Intel 8216 bus interface and the Intel 2149 RAM specifications are set forth in the referenced Intel catalogs; which are herein incorporated by reference.

1. Texas Instruments, ALS/AS Logic Circuits Data Book, 1983.
2. Texas Instruments, The TTL Datas [sic] Book, Volume 3, 1984.
3. Texas Instruments, The TTL Pocket Data Book, 1983.
4. Intel, Component Data Catalog, 1981.
5. Intel, Memory Components Handbook, 1984.
6. Motorola, Schottky TTL Databook, 1981.

Various circuits used in the experimental system are described in the following list of component specifications, which are herein incorporated by reference.

1. TRW, LSI D/A Converters, TDC1016J-8/9/10.
2. TRW, Monolithic Video D/A Converters; TDC1016J-8, TDC0106J-9, TDC1016J-10; 1979.
3. Texas Instruments, TMS-4016, 2048-Word By 8-Bit Static RAM.

4. National Semiconductor, ADC0800 8-Bit A/D Converter.
5. National Semiconductor, MM5321 TV Camera Sync Generator.
6. Signetics, Hex Buffers/Inverters; 8T95, 96, 97, 98.
7. Mitsubishi; M58725P,S;P-15,S-15; 16384-BIT (2048-word by 8-bit static RAM.

See Spec. at 372-373.

Circuit Boards

The experimental system is implemented with wire wrap circuit boards consisting of 2-Memory Boards (BM1 and BM2), 1-Logic Board (BL1), 1-Buffer Board (BB1), and 1-Rear End Board (BR1). Each board is constructed with a Vector board, manufactured by Vector Electronic Company of Sylmar CA, having 1/10th inch hole spacings on a 17-inch by 8 1/2-inch board. Wire wrap DIP sockets and cable connectors are inserted into the Vector board and interconnected with wire wrap interconnections. Information on the DIPs plugged-in to the DIP sockets is provided for selected boards in the printout of the TABLE OF DIP LAYOUT ON BOARDS included herewith. Information on the cable connectors is provided for each cable in the printout of the CABLE CONNECTION TABLE included herewith.

DIP assignments are provided for selected boards in the TABLE OF DIP LAYOUT ON BOARDS included herewith, for each board. DIPs are arranged on the boards as rows identified with alphabetical symbols; i.e., A to E; and as columns identified with numerical symbols; i.e., 1 to 23. Each DIP position on a board is identified with a U symbol followed by the column and row symbols (i.e., U3A).

Logical schematic diagrams showing implementation of the experimental system are provided herewith, such as shown in Fig 6. These logical diagrams show standard commercially available integrated circuits; such as TTL series 7400 ICs, Mitsubishi M58725 RAMs, and 8216 bi-directional bus drivers, and Sygnetics 8T97 buffers. Specifications for these integrated circuits are available in catalogs and specification sheets from the abovementioned manufacturers and are well known in the art.

The schematic diagrams show the logical function in symbolic form, identify the type of IC, identify the DIP numbers and pin numbers, and show wiring interconnections between DIP and pin numbers. Device types are often shortened, such as shortening the name 74LS02

to LS02. DIP assignments are identified with U numbers, such as U20C representing the DIP at row-20 column-C on the subject circuit board. For example, a NOR-gate is shown at the top portion of Fig 6B identified with the designation LS02 as being a 74LS02 quad NOR-gate integrated circuit, identified with the designation U21C as being located on the BL1 circuit board at row-C column-21, and having 2-input signals on pin-11 and pin-12 of the DIP and one output signal on pin-13 of the DIP. The input to pin-11 is shown connected to the output of DIP U22B pin-3, the input to pin-12 is shown connected to the output of DIP U20B pin-12, and the output from pin-13 is shown connected to DIP U7D pin-9. For convenience of documentation, interconnections may be designated by the DIP identification number and pin number separated by a dash; i.e., U21C- 13 representing pin-13 of DIP U21C. For convenience of discussion, logical circuits may be designated by the DIP identification number and the output pin number separated by a dash; i.e., U21C-13 representing pin-13 of DIP U21C.

See Spec. at 293-294.

The use and disclosure of commercial products is clearly described in the specification, the commercial design documentation is incorporated-by-reference into the instant disclosure, and the commercial design documentation was filed in the PTO as a disclosure document so that the public would have access to this documentation after a patent issued.²²⁷

DISCLOSURE DOCUMENT

A disclosure document has been filed in the U.S. Patent and Trademark Office on or about Oct. 18, 1984 No. ____ [131,747]; which is herein **incorporated by reference**. This disclosure document has copies of many of the documents and specification sheets referenced herein as follows.

1. National Semiconductor specification sheet for the MM5321 synchronization generator.
2. Signetics specification sheet for the 8T95, 96, 97, 98 hex buffers/inverters.
3. National Semiconductor specification sheet for the ADC 0800 A/D converter.
4. Texas Instruments specification sheet for the TNS-4016 RAM.

²²⁷ See Spec. at 575-576 (emphasis and bracketed term added).

5. TRW specification sheet for the TDC1016J-8, TDC1016J-9, TDC1016J-10 video D/A converters.
6. Mitsubishi Electric specification sheet for the M58725P, S;P-15, S-15, RAMs.
7. Computer Compatible Joystick Instruction sheet.
8. CompuPro CPU 8085/88 Technical Manual.
9. Viewpoint/3A Plus User's Manual.
10. CompuPro RAM 17 Technical Manual.
11. CompuPro RAM 16 Technical Manual.
12. CompuPro 8080 Multi-User Monitor program listing.
13. CompuPro System Support 1 User Manual.
14. International Instrumentation Incorporated Universal Disk Enclosures manual.
15. Siemens OEM Floppy Disk Drive FDD 100-8 manual.
16. CompuPro Disk 1 User Manual.

In view of the above, the application has extensive enabling disclosure. Hence, the § 112-1 enablement rejections should be reversed.

7.5.5 The Disclosure Has Extensive Schematic Details Down To The Component Level And Wire Level

The disclosure is enabling, including extensive design details. For example, actual "off the shelf" electrical components are shown interconnected in detailed schematic diagrams. The specification has extensive discussions of the schematic components, interconnections, and signals. The disclosure even provides well known component schematic symbols with pin²²⁸ designations and with many individual wire connections between circuit components (e.g., Figs. 6B-6D). For example, the Motorola Schottky TTL Data book (see the excerpts in Section 9.4) is expressly incorporated by reference into the instant disclosure (Spec. at 372). Many of the integrated circuit (IC) components that are shown in the schematic diagrams (e.g., Figs. 6B-6D) are shown in extensive detail in the Motorola Schottky TTL Data book with detailed design information and are discussed in the specification (See, e.g., Spec. at 300 et seq.).

²²⁸ Electronic components are usually interconnected with discrete wires or printed wires between pins (terminals) on the components. The pins on integrated circuit components are often assigned schematic notations. These same schematic pin notations are shown with the integrated circuit components, for example, in Figs. 6B-6C.

The TTL integrated circuits (ICs) are designated S/N 7400 (or SN7400) ICs. Each type of IC component has a serial number with a prefix "74" and with a suffix defining the type of IC component.²²⁹ For example, an SN7402 IC is a quad 2-input NOR gate, an SN7404 IC is a hex inverter, an SN7411 IC is a triple 3-input AND gate, and an SN74174 IC is a hex D-type flip-flop with clear. See, e.g., the Motorola Schottky TTL Data book at ii to vi.

Many individual wire connections are shown connected to the logic gate, inverter, and flip-flop components. For example, near the lower right hand part of Fig. 6B, a wire CXRM is shown connected from output pin-3 of OR-gate U18C (schematically referred to as signal U18C-3) and is shown connected to input pin-1 of inverter U8A (schematically referred to as signal U8A-1).

The specification includes extensive detailed discussions of the circuitry and the interconnection thereof, as illustrated with the following representative quotation regarding Fig. 6B.²³⁰

R-register gating logic will now be discussed **with reference to Fig 6B.**

Gate U19C-1²³¹ steers the load strobe U22B-3 to clock the register with the computer generated strobe to load the computer generated parameter into the related register. Steering signal U19C-3 steers the computer pulse U19C-2 to the input of gate U18C-1. Gate U18C-3 combines the two mutually exclusive clock signals, the computer strobe and the line sync strobe to clock the XR-register CXRM with signal U18C-3 for the computer strobe and on the rising edge of the line sync pulse.

Gate U19C-10 steers the load strobe U22B-3 to clock the register with the computer generated strobe to load the computer generated parameter into the related register. Steering signal U19C-9 steers the computer pulse U19C-8 to the input of gate U18C-9. Gate

²²⁹ Letters are also used in the serial number to identify characteristics of the ICs. For example, an "F" is used to designate a fast SN7400 IC (SN74F00), an "L" is used to designate a low-power SN7400 IC (SN74L00), an "S" is used to designate a Schottky SN7400 IC (SN74S00), an "LS" is used to designate a low-power Schottky SN7400 IC (SN74LS00), and an "ALS" is used to designate an advanced low-power Schottky SN7400 IC (SN74ALS00). See, e.g., the Motorola Schottky TTL Data book at 1-2 (section 1 page 2).

²³⁰ The circuits, signals, and interconnections quoted below are labeled consistent with the circuits, signals, and interconnections shown in Fig. 6B. This quoted material can be better understood if reference is made to Fig. 6B.

²³¹ "U19C-1", for example, means the signal or connection at pin 1 of circuit "U19C". Fig. 6B at the middle right side shows U19C-1 as being the output pin "1" of the circuit "U19C", which is labeled as an LS02 (74LS02) type integrated circuit. A 74LS02 integrated circuit is identified as a NOR circuit in the referenced integrated circuit Data Book and U19C in Fig. 6B is shown with a well known NOR gate symbol.

U18C-8 combines the two mutually exclusive clock signals, the computer strobe and the line sync strobe to clock the XR-register CXRL with signal U18C-8 for the computer strobe and on the rising edge of the line sync pulse.

Gate U19D-1 steers the load strobe U22B-3 to clock the register with the computer generated strobe to load the computer generated parameter into the related register. Steering signal U19D-3 steers the computer pulse U19D-2 to the input of gate U18C-4[.] Gate U18C-6 combines the two mutually exclusive clock signals, the computer strobe and the line sync strobe to clock the YR-register CYRM with signal U18C-6 for the computer strobe and on the rising edge of the line sync pulse.

Gate U19D-13 steers the load strobe U22B-3 to clock the register with the computer generated strobe to load the computer generated parameter into the related register. Steering signal U19D-12 steers the computer pulse U19D-11 to the input of gate U18C-12. Gate U18C-11 combines the two mutually exclusive clock signals, the computer strobe and the line sync strobe to clock the YR-register CYRL with signal U18C-11 for the computer strobe and on the rising edge of the line sync pulse.

See Spec. at 314-315 (emphasis and footnote added).

Many individual wire connections are shown connected to the logic gate, inverter, and flip-flop components. See, e.g., Figs. 6B-6AH.

In view of the above example, the application has an extensive enabling disclosure. Hence, the enablement rejections should be reversed.

7.5.6 The Skill In The Relevant Arts Is High, But The Examiner Misrepresented It As Being Low

7.5.6.1 The Skill In The Computer And Programming Arts Was High As Of The Effective Filing Date

Notwithstanding the claimed invention being extensively supported by express disclosures, the high skill in the art establishes extensive additional and alternative bases for enabling the instant claimed invention in the instant disclosure.

Even though it is not necessary in view of the high skill in the relevant arts, the application discloses in great detail an actually reduced-to-practice “experimental system” that provides significant guidance to an artisan (e.g.; Sections 5.7 and 7.3.10). The Appellant has also disclosed video tapes in Disclosure Documents filed in the PTO showing operation of the reduced-to-practice system (Section 7.3.16). This is in addition to the extensive top-down end-to-end disclosure (e.g.; Section 5.6). See also Sections 7.5.8 and 7.5.10.

There should be no dispute, that the skill in the computer arts was high as of the effective filing date of the instant application (Section 7.5.6.1). The early 1980s saw third generation microcomputers (the Intel 80286 microcomputer), the second generation Apple computers (the Apple Macintosh personal computer), and the second generation IBM personal computer (the IBM AT personal computer). See Section 9.3.²³²

The MPEP confirms the significant latitude in disclosing software aspects of inventions.²³³

The claimed invention subject matter need not be described literally, i.e., using the same terms, in order for the disclosure to satisfy the description requirement. Software aspects of inventions may be described functionally. *See Robotic Vision Sys. v. View Eng'g, Inc.*, 112 F.3d 1163, 1166, 42 USPQ2d 1619, 1622-23 (Fed. Cir. 1997); *Fonar Corp. v. General Electric Co.*, 107 F.3d 1543, 1549, 41 USPQ2d 1801, 1805 (Fed. Cir. 1997); *In re Hayes Microcomputer Prods., Inc.*, 982 F.2d 1527, 1537-38, 25 USPQ2d 1241, 1248-49 (Fed. Cir. 1992).

The functional disclosure of software aspects of inventions are also suitable for enablement:

Although a specification that meets the written description requirement always satisfies the enablement requirement, the converse is not always true....

Hunter.²³⁴ The skill in the art is very important to the issue of § 112-1 enablement. The PTO at MPEP 2164.01 confirms that an enablement analysis must involve the perspective of “one reasonably skilled in the art” and include “information known in the art”:

²³² See, e.g.; The Computer History Museum – Timeline available at http://www.computerhistory.org/timeline/timeline.php?timeline_category=cmptr (last visited June 1, 2005).

²³³ MPEP at § 2106, in discussing compliance with the written description requirement at B.1. (pp. 2100-20, Revision 2, dated May 2004).

See also *United States v. Telectronics, Inc.*, 857 F.2d 778, 785, 8 USPQ2d 1217, 1223 (Fed. Cir. 1988) (“The test of enablement is whether one reasonably skilled in the art could make or use the invention from the disclosures in the patent coupled with information known in the art without undue experimentation.”) A patent need not teach, and preferably omits, what is well known in the art. *In re Buchner*, 929 F.2d 660, 661, 18 USPQ2d 1331, 1332 (Fed. Cir. 1991); *Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1384, 231 USPQ 81, 94 (Fed. Cir. 1986), *cert. denied*, 480 U.S. 947 (1987); and *Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 1463, 221 USPQ 481, 489 (Fed. Cir. 1984).

In the present case, the skill in the relevant arts was high. The electronics art was highly predictable and computer programming was routine. This is particularly so in this case because the starting point is the instant disclosure which includes the disclosed actually reduced-to-practice “experimental system” having extensive “working examples” of computer system implementation, programming, and mathematical analyses.

The Federal Circuit established that the skill in the relevant arts; here the electrical, computer, and programming arts; was high as of the late 1960s, significantly before the instant effective filing date, as established by the Federal Circuit.

It is well established that the skill in the programming art was high as of 1969:

In [Expert witness] Bell’s deposition testimony ... he averred:

Q. Would it have been obvious in June of ‘69 for someone of ordinary skill to write the program for a computer to operate as a source data entry terminal given the functions of the source data entry terminal?

A. Yes.

Northern Telecom.²³⁵

It is well established that the skill in the logic design²³⁶ art was high as of 1967:

²³⁴ *In re Hunter*, No. 94-1301, 1995 U.S. App. LEXIS 15363, at *14 (Fed. Cir. June 19, 1995).

²³⁵ *Northern Telecom Inc. v. Datapoint Corp.*, 908 F.2d 931, 15 USPQ2d 1321, 1329, (Fed. Cir. 1990), *cert. denied*, 498 U.S. 970.

²³⁶ “Logic design” is the design with digital “logic” (e.g.; AND gates, OR gates, NAND gates, and NOR gates) to implement digital devices (e.g.; digital processors).

DeGeorge need not disclose all circuit details of a word processor or the like. DeGeorge's expert witness Tanner, a graduate electrical engineer with years of design experience on word processors, testified that "any logic designer of a normal ability should be able to implement functions given this much description [in the *per se* '670 disclosure] about them." ...

It is undisputed that counters, comparison circuits, and logic circuits for detecting input signals from a word processor were all familiar to those with skill in logic design, and particularly printer control logic design, in 1967. At that time, there was nothing exotic or unique about the logic elements of the TCCPI circuit and how they interfaced with signal generating control circuits in a word processor.

DeGeorge.²³⁷

The CCPA and the Federal Circuit citing to In re Fisher "respecting enablement" reiterated "the high level of predictability in mechanical or electrical environments". See Hormone, Hogan, and Fisher.²³⁸ The courts permit and actually prefer a disclosure to rely on what is known in the art and not to repeat that which is already known:

If these bridge-gapping tools (the input and the output) are disclosed, there would seem to be no cogent reason to require disclosure of the menial tools known to all who practice this art.

Sherwood.²³⁹

[P]aragraph 112-1 does not require that the specification contain what is well known to those skilled in the art. Id.; Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co., 730 F.2d 1452, 1463, 221 U.S.P.Q. 481, 489 (Fed. Cir. 1984).

Hyatt-'253.²⁴⁰

²³⁷ DeGeorge v. Bernier, 768 F.2d 1318, 226 USPQ 758, 762 (Fed. Cir. 1985) (emphasis added).

²³⁸ Hormone Research Foundation Inc. v. Genentech Inc., 904 F.2d 1558, 15 USPQ2d 1039, 1048 (Fed. Cir. 1990) (quoting In re Hogan, 559 F.2d 595, 194 USPQ 527, 537-538 (CCPA 1977)) (discussing In re Fisher, 427 F.2d 833, 166 USPQ 18, 24 (CCPA 1970)).

²³⁹ In re Sherwood, 613 F.2d 809, 816, 204 USPQ 537, 544 FN 8 (CCPA 1980), cert. denied, 450 U.S. 994 (1981) (parenthetical expression added).

²⁴⁰ In re Hyatt, Appeal No. 87-1597 in patent application Serial No. 05/860,253 (Fed. Cir. 1988) [herein Hyatt-'253] (unpublished decision).

Obviously, it is not necessary that an applicant be more specific than is required by section 112, portion [A] [para. 1]. Not every last detail is to be described, else patent specifications would turn into production specifications, which they were never intended to be. United States specifications have often been criticized as too cluttered with details to give an easy understanding of what the invention really is.

Gay.²⁴¹

The U.S. Supreme Court established that a patent application is to be directed to a person skilled in the art and that knowledge which is common and well known is as if it were written out in the patent and delineated in the drawings:

The specification ... proceeds to describe the mechanism of the invention by a description and reference to drawings ... all which would be incomprehensible to a person unacquainted with looms for weaving pile fabrics, but very plain to one who understood their construction and operation at the date of the patent. A person skilled in the art of constructing or using such looms ... would readily appreciate the meaning of the terms and the character of the improvement described...

When an astronomer reports that a comet is to be seen with the telescope in the constellation of Auriga, in so many hours and minutes of right ascension, it is all Greek to the unskilled in science; but other astronomers will instantly direct their telescopes to the very point in the heavens where the stranger has made his entrance into our system. They understand the language of their brother scientist. If a mechanical engineer invents an improvement on any of the appendages of a steam engine ... he is not obliged, in order to make himself understood, to describe the engine, nor the particular appendage to which the improvement refers, nor its mode of connection with the principle machine. These are already familiar to others skilled in that kind of machinery. He may begin at the point where his invention begins, and describe what he has made that is new, and what it replaces of the old. **That which is common and well known is as if it were written out in the patent and delineated in the drawings.**

Loom.²⁴²

²⁴¹ In re Gay, 309 F.2d 769, 774, 135 USPQ 311, 316 (CCPA 1962).

²⁴² Loom Co. v. Higgins, 105 U.S. 580, 585 (1881) (emphasis added).

A proper consideration of the skill in the relevant arts establishes that the technology involved in the instant claims was well understood and highly predictable at the effective filing date.

The Board, in a copending application, reversed enablement rejections stating:²⁴³

... the fact that limitations are not described does not establish that it would take undue experimentation for one of ordinary skill in the art to make what is claimed. **The level of skill in the pertinent arts of computers, memory architecture, and computer programs was high.** Although the Wands factors are only for guidance, the examiner has not provided any explanation of why one of ordinary skill could not make the broadly claimed subject matter without undue experimentation. We conclude that the examiner has failed to make out a prima facie case of lack of enablement, not that the claimed subject matter is enabled.

Similarly, the instant § 112-1 enablement rejections should also be reversed for failure to establish a prima facie case.

The courts have established the high skill in the relevant arts at an early time in the evolution in the relevant arts. For example, the court in Robotic Vision, stated:²⁴⁴

We have previously held in *Hayes* and in *Fonar* (after the district court decided this case) that when disclosure of software is required, **it is generally sufficient if the functions of the software are disclosed**, it usually being the case that creation of the specific source code is within the skill of the art

Further, the court in *Hayes* stated:²⁴⁵

One skilled in the art would know how to program a microprocessor to perform the necessary steps described in the specification. Thus, an inventor is not required to describe every detail of his invention. An applicant's disclosure obligation varies according to the art to which the invention pertains. Disclosing a microprocessor capable of performing certain functions is sufficient to satisfy the requirement of section 112, first paragraph, when one skilled in the

²⁴³ *Ex parte Hyatt*, Appeal No. 2002-0652, at 32-33 in patent application Serial No. 08/465,072 (PTO Bd. App. June 30, 2003) [herein *Hyatt-072*] (unpublished PTO decision) (emphasis added). See also *Hyatt v. Dudas*, No. 04-CV-1139 (HHK) (D.D.C.)

²⁴⁴ *Robotic Vision Systems, Inc. v. View Engineering Inc.*, 112 F.3d 1163, 42 USPQ2d 1619, 1622-23 (Fed. Cir. 1997).

²⁴⁵ *In re Hayes*, 982 F.2d 1527, 25 USPQ2d 1241 (Fed. Cir. 1992).

relevant art would understand what is intended and know how to carry it out.

The filing date of the application involved in Hayes was June 19, 1981.

Still further, the court in Fonar stated:²⁴⁶

As a general rule, where software constitutes part of a best mode of carrying out an invention, **description of such a best mode is satisfied by a disclosure of the functions of the software**. This is because, normally, writing code for such software is within the skill of the art, not requiring undue experimentation, once its functions have been disclosed. It is well established that what is within the skill of the art need not be disclosed to satisfy the best mode requirement as long as that mode is described. Stating the functions of the best mode software satisfies that description test. We have so held previously and we so hold today Thus, flow charts or source code listings are not a requirement for adequately disclosing the functions of software.

The filing date of the application involved in Fonar was March 17, 1972.

As recently as 2004, the Federal Circuit in Chiron stated:²⁴⁷

Moreover, the prior application must enable one of ordinary skill in the art to practice 'the full scope of the claimed invention.' In re Wright Clarifying this principle, this court has explained: 'That is not to say that the specification itself must necessarily describe how to make and use every possible variant of the claimed invention, for the artisan's knowledge of the prior art and routine experimentation can often fill gaps, interpolate between embodiments, and perhaps even extrapolate beyond the disclosed embodiments, depending upon the predictability of the art.'

Yet further, the CCPA in Bowen stated:²⁴⁸

As we explained in In re Fisher, 57 CCPA at 1108, 427 F.2d at 839, 166 USPQ at 24:

In cases involving predictable factors, such as mechanical or electrical elements, a single embodiment provides broad enablement in the sense that, once imagined,

²⁴⁶ Fonar v. General Electric, 107 F.3d 1543, 41 USPQ2d 1801 (Fed. Cir. 1997) (emphasis added).

²⁴⁷ Chiron v. Genentech, 70 USPQ2d 1321, 1325 (Fed. Cir. 2004).

²⁴⁸ In re Bowen, 492 F.2d 859, 181 USPQ 48 at 50 (CCPA 1974).

other embodiments can be made without difficulty and their performance characteristics predicted by resort to known scientific laws. In cases involving unpredictable factors, such as most chemical reactions and physiological activity, the scope of enablement obviously varies inversely with the degree of unpredictability of the factors involved.

Of course, this discussion would not be complete without addressing Sherwood. The filing date of the application involved in Sherwood was April 14, 1975. The CCPA in Sherwood established that “the touchstone [for § 112-1] is the content, not the form”, and that § 112-1 can be satisfied with a “verbal flow chart”.²⁴⁹

Taking into account the expert opinions found in the two affidavits, it would appear that the detailed disclosure of the analog method in combination with the suggestion that a digital method should be used might be more enlightening to one having ordinary skill in the art than the computer listing or flow chart required by the PTO. We view the PTO’s requirement as quite formalistic in view of the verbal flow chart provided by appellant in the specification. In any event, the touchstone is the content, not its form.

The CCPA in Sherwood then applied this century-old U.S. Supreme Court wisdom to computer programming.²⁵⁰

In general, writing a computer program may be a task requiring the most sublime of the inventive faculty or it may require only the droning use of a clerical skill. The difference between the two extremes lies in the creation of mathematical methodology to bridge the gap between the information one starts with (the “input”) and the information that is desired (the “output”). If these bridge-gapping tools are disclosed, there would seem to be no cogent reason to require disclosure of the menial tools known to all who practice this art.

In assessing any computer-related invention, it must be remembered that the programming is done in a computer language. The computer language is not a conjuration of some black art, it is simply a highly structured language. Analogously, if a person were to express a complete thought in German, it would be no trick for a translator to convert that thought into a palpable English form. The thought, thus

²⁴⁹ In Re Sherwood, 613 F.2d 809, 204 USPQ 537, 544-545 n.8 (CCPA 1980) (emphasis added).

²⁵⁰ In Re Sherwood, 613 F.2d 809, 204 USPQ at 544, 544 n.6, and 544-545 n.8, respectively (CCPA 1980).

expressed, might not be worthy of Shakespeare, but it would be understandable to one who uses the English language. Similarly, the conversion of a complete thought (as expressed in English and mathematics, i.e., the known input, the desired output, the mathematical expressions needed and the methods of using those expressions) into the language a machine understands is necessarily a mere clerical function to a skilled programmer.

Taking into account the expert opinions found in the two affidavits, it would appear that the detailed disclosure of the analog method in combination with the suggestion that a digital method should be used might be more enlightening to one having ordinary skill in the art than the computer listing or flow chart required by the PTO. We view the PTO's requirement as quite formalistic in view of the verbal flow chart provided by appellant in the specification. In any event, the touchstone is the content, not its form.

In view of the above and in addition to the extensive enabling disclosure in the instant application, the skill in the art provides still further basis for enablement. In the instant application, the skill in the relevant art was high and the disclosure has far more than is necessary, including an actually-reduced-to-practice embodiment and an extensive top-down end-to-end disclosure (e.g.; Section 5.6). If the Examiner had properly analyzed the skill in the art regarding the § 112-1 enablement rejections, such an analysis would have revealed that the claims do indeed meet the § 112-1 enablement requirement. Hence, the § 112-1 enablement rejections should be reversed.

7.5.6.2 The Examiner Misrepresents The Skill In The Art

The Examiner misrepresents the skill in the relevant arts as being low at the effective filing date of the instant application. However, it is well established that the skill in the relevant arts was high at the effective filing date. See Sections 7.5.6.1 and 7.5.8.3. Thus, for this reason alone, the § 112-1 enablement rejections fail to establish a prima facie case.

The Examiner cites to references that are supposed to attempt to establish a low skill in the art but, if anything, establishes the high skill in the art (discussed below). The Examiner cites to Sullivan, Rogoff, Hudson, and Egeli to attempt to create a low skill in the art and lack of enablement issue, but this position is erroneous. These references contradict the Examiner's position.

The Examiner draws self-serving conclusions from Sullivan, Rogoff, Hudson, and Egeli, which does not establish the skill in the art nor lack of enablement for the instant application. These references are not authorities regarding the “requirements” for enablement, they are references selected by the Examiner to attempt to show a low skill in the art. Remarkably, these references help establish the Appellant’s position that the skill in the relevant arts was high. Second, Hudson and Egeli are articles that bear no presumption of enablement or other credible basis for the Examiner’s conclusions. Articles do not have to be enabling and do not establish a low skill in the art.

Sullivan and Rogoff are patents which show enablement for the invention claimed therein, not necessarily for some other non-claimed invention.

As an example, these references lack the detailed schematic diagrams such as provided in the instant disclosure. The general block diagrams in Sullivan, Rogoff, and Egeli and the absence of even a block diagram in Hudson contradict the Examiner’s position. In contrast, the instant application discloses not only detailed block diagrams in a top-down end-to-end format (e.g.; Section 5.6) but provides detailed schematic diagrams for an actually reduced-to-practice “experimental system”. Thus, independent of the skill-in-the-art, the extensive disclosure in the instant application is significantly more enabling than the disclosure in these references.

As another example, these references lack the detailed theoretical background disclosed in the instant disclosure. The sparse equations, cartoons, and discussions in these references hardly match the derivation of the window geometries (e.g., Figs 2A-2G, Spec. at 75-93) and the other disclosures of the theoretical background provided in the instant application. For example, see Sullivan’s terse cartoon (Fig. 2A) and Rogoff’s terse cartoons (Figs. 1 and 2). In contrast, the instant disclosure provides extensive theoretical background for the software and hardware implementations. See, e.g., Figs. 2C-2G and the Spec. at 80-92 related thereto.

As yet another example, these references use what appear to be blocks designed specifically for the systems, yet the instant disclosure incorporates many commercially available products (in addition to specifically designed software and hardware) ranging from commercially available integrated circuits to a commercially available computer and computer operating system software.

As yet another example, the instant application discloses input and output software (e.g.; with a commercially available operating system program) and input and output hardware (e.g.; with commercially available computer input/output circuit cards).

The skill in the art was sufficient to enable an artisan to practice the invention by merely disclosing “the functions of the software”:

We have previously held in *Hayes* and in *Fonar* (after the district court decided this case) that when disclosure of software is required, it is generally sufficient if the functions of the software are disclosed, it usually being the case that creation of the specific source code is within the skill of the art

Robotic Vision.²⁵¹

The MPEP confirms that “[s]oftware aspects of inventions may be described functionally”.²⁵²

The claimed invention subject matter need not be described literally, i.e., using the same terms, in order for the disclosure to satisfy the description requirement. Software aspects of inventions may be described functionally. See *Robotic Vision Sys. v. View Eng'g, Inc.*, 112 F.3d 1163, 1166, 42 USPQ2d 1619, 1622-23 (Fed. Cir. 1997); *Fonar Corp. v. General Electric Co.*, 107 F.3d 1543, 1549, 41 USPQ2d 1801, 1805 (Fed. Cir. 1997); *In re Hayes Microcomputer Prods., Inc.*, 982 F.2d 1527, 1537-38, 25 USPQ2d 1241, 1248-49 (Fed. Cir. 1992).

However, the Examiner misrepresents the extensive functional disclosures of the “[s]oftware aspects” in the instant disclosure.

The CCPA in *Sherwood* established that “the touchstone [for § 112-1] is the content, not the form”, and that § 112-1 can even be satisfied with a “verbal flow chart” (e.g.; Section 7.5.6.1).²⁵³ See also, e.g., Section 7.3.11 for a discussion of software disclosure.

Further, the Examiner misrepresents the relevant skill in the art. It is well established that the skill in the art was high (Section 7.5.6.1).

²⁵¹ *Robotic Vision Systems, Inc. v. View Engineering Inc.*, 112 F.3d 1163, 42 USPQ2d 1619, 1622-23 (Fed. Cir. 1997).

²⁵² MPEP at § 2106, in discussing compliance with the written description requirement at B.1. (pp. 2100-20; Revision 2, May 2004).

²⁵³ *In Re Sherwood*, 613 F.2d 809, 204 USPQ 537, 544-545 n.8 (CCPA 1980).

In view of the above, the Examiner's skill in the art related references contradict the Examiner's position regarding skill in the art.

7.5.7 The Examiner Has Not Established Why It Would Take Undue Experimentation For An Artisan To Make Or Use The Claimed Invention, Particularly In View Of The Extensively Disclosed Actually Reduced-To-Practice "Experimental System"

7.5.7.1 Introduction

Enablement is based upon an artisan being able to make and use the claimed invention without undue experimentation (Section 7.5.2). However, the Examiner has not established that any experimentation is necessary much less undue experimentation (e.g.; Section 7.5.8), nor that an artisan would not be able to make the claimed invention (Section 7.5.7.3), nor that an artisan would not be able to use the claimed invention (Section 7.5.7.2). This is not surprising; because the skill in the art was high (Section 7.5.6.1), because the relevant arts are computer systems and programming (Section 7.3.11), because of the extensive disclosure (e.g.; Section 5), and because of the law on experimentation (Section 7.5.8.2); it is unlikely that the Examiner could establish any experimentation much less undue experimentation.

The Examiner goes on and on misrepresenting the skill in the art and misrepresenting the disclosure, but the Examiner avoids the fundamental issues of (a) making and using a computer system in view of the extensive disclosure and in view of Fonar, Hayes, and Sherwood²⁵⁴ (Sections 7.4.2, 7.5.2, 7.5.6.1, and 7.5.8.4). and (b) what constitutes undue experimentation in view of the high skill in the art, the extensive disclosure, and the law of Norwest, WICOR, and United Stationers²⁵⁵ (e.g.; Section 7.5.8.3). Clearly, dealing with these issues would defeat the enablement rejections on the merits.

²⁵⁴ Fonar Corp. v. General Electric Co., 107 F.3d 1543, 41 USPQ2d 1801 (Fed. Cir. 1997); In re Hayes Microcomputer Products Inc., 982 F.2d 1527, 25 USPQ2d 1241 (Fed. Cir. 1992); In Re Sherwood, 613 F.2d 809, 204 USPQ 537 (CCPA 1980).

²⁵⁵ Norwest Corporation and Subsidiaries v. Commissioner of Internal Revenue, 110 TC 454, 507-508 (1998); WICOR, Inc. and Subsidiaries v. United States, 116 F. Supp. 2d 1028, 1035-36 (E.D. Wis. 2000); United Stationers, Inc. v. United States, 163 F.3d 440, 445-46 (7th Cir. 1998).

Conversely, disregarding these issues defeats the enablement rejections because of the Examiner's failure to establish a prima facie case.

7.5.7.2 The Examiner Has Not Established Why Undue Experimentation Would Be Required To Use The Claimed Invention

The Examiner has not established why an artisan could not use the claimed invention without undue experimentation. But this is not surprising, how would the Examiner convince the Board that an artisan would have a problem using a computer system, particularly a computer system that is so extensively disclosed? Of course an artisan would not have a problem using such a computer system. The reason that the Examiner does not clearly address this issue must certainly be because an artisan would readily be enabled to use such a computer system and such an analysis would defeat the enablement rejections.

MPEP at 2164.01(c) confirms that the instant disclosure provides much more than is necessary for utility of the claimed invention – thus “35 U.S.C. 112 is satisfied”:

If a statement of utility in the specification contains within it a connotation of how to use, and/or the art recognizes that standard modes of administration are known and contemplated, 35 U.S.C. 112 is satisfied.

Thus, an artisan would readily be able to use the extensively disclosed computer system. Further, the instant disclosure provides many examples of how to use the disclosed actually reduced-to-practice “experimental system” and video tapes of the disclosed actually reduced-to-practice “experimental system” being used.

In view of the above, there should be no question that the instant application satisfies § 112-1 regarding how to use the claimed invention without undue experimentation.

7.5.7.3 The Examiner Has Not Established Why Undue Experimentation Would Be Required To Make The Claimed Invention

The Examiner has not established why an artisan could not make the claimed invention without undue experimentation. But this is not surprising, how would the Examiner convince the Board that an

artisan would have a problem making a computer system, particularly a computer system that is so extensively disclosed? Of course an artisan would not have any trouble making such a computer system. The reason that the Examiner does not clearly address this issue must certainly be because an artisan would readily be enabled to make such a computer system and such an analysis would defeat the enablement rejections.

The Examiner has not established why an artisan could not use the claimed invention for the reasons discussed above (Sections 7.5.7.1 and 7.5.7.2) regarding the issue of use of the claimed invention. For example, an artisan would readily be able to make the extensively disclosed computer system invention from commercially available products; e.g.; the disclosed commercially available computer, software, and integrated circuits. Further, an artisan would readily be able to make the extensively disclosed custom software and hardware features from well known programming (e.g.; Basic) and electronic wiring (wire wrap) methods as disclosed for the “experimental system”. Further, the instant disclosure provides many examples of how to make the disclosed actually reduced-to-practice “experimental system”. This is particularly so in view of the law of enablement (Section 7.5.2). See also, e.g.; Fonar, Hayes, and Sherwood²⁵⁶ (Sections 7.4.2, 7.5.2, 7.5.6.1, and 7.5.8.4).

This is particularly so because it is well established that the computer art does not need the type of disclosure demanded by the Examiner (Sections 7.4.2, 7.5.2, 7.5.6.1, and 7.5.8.4) and for the additional reason that the application includes extensive disclosure of the actually reduced-to-practice “experimental system” (Sections 5.7 and 7.3.10).

In view of the above, there should be no question that the instant application satisfies § 112-1 regarding how to make the claimed invention.

²⁵⁶ Fonar Corp. v. General Electric Co., 107 F.3d 1543, 41 USPQ2d 1801 (Fed. Cir. 1997); In re Hayes Microcomputer Products Inc., 982 F.2d 1527, 25 USPQ2d 1241 (Fed. Cir. 1992); In Re Sherwood, 613 F.2d 809, 204 USPQ 537 (CCPA 1980).

7.5.8 The Examiner Has Not Established That Any Experimentation Would Be Required In View Of The Actually Reduced-To-Practice “Experimental System” And The Extensive Disclosure

7.5.8.1 Introduction

Enablement is established, as here, when there is **no** “undue experimentation”.

The test of enablement is whether one reasonably skilled in the art could make or use the Invention from the disclosures in the patent coupled with information known in the art without undue experimentation.

Telectronics.²⁵⁷ The PTO confirms that “experimentation” is the standard for enablement. MPEP 2164.01.

The standard for determining whether the specification meets the enablement requirement was cast in the Supreme Court decision of *Mineral Separation v. Hyde*, 242 U.S. 261, 270 (1916) which postured the question: is the experimentation needed to practice the invention undue or unreasonable? That standard is still the one to be applied. *In re Wands*, 858 F.2d 731, 737, 8 USPQ2d 1400, 1404 (Fed. Cir. 1988). Accordingly, even though the statute does not use the term “undue experimentation.” It has been interpreted to require that the claimed invention be enabled so that any person skilled in the art can make and use the invention without undue experimentation. *In re Wands*, 858 F.2d at 737, 8 USPQ2d at 1404 (Fed. Cir. 1988). *See also United States v. Telectronics, Inc.*, 857 F.2d 778, 785, 8 USPQ2d 1217, 1223 (Fed. Cir. 1988) (“The test of enablement is whether one reasonably skilled in the art could make or use the invention from the disclosures in the patent coupled with information known in the art without undue experimentation.”)

Hence, if there is **no** undue experimentation, enablement is established.

The Examiner has not established any experimentation at all, relying entirely on conclusory statements that there is undue experimentation (see, e.g., prior Action at 21, 22, 23, and 24). This is fatal to the § 112-1 enablement rejections particularly in view of the clear law on experimentation

²⁵⁷ United States v. Telectronics, Inc., 857 F.2d 778, 785, 8 USPQ2d 1217, 1223 (Fed. Cir. 1988).

(Section 7.5.8). This was confirmed by Judge Lindquist in Hyatt-'053²⁵⁸, in reversing an enablement rejection under § 112-1:

OPINION * * *

Nor has the examiner addressed the “undue experimentation” aspect of enablement other than to just conclude that undue experimentation would be required for enablement. We will not sustain the rejection.

The nature of experimentation is articulated in Norwest, WICOR, and United Stationers (e.g.; Section 7.5.8.2),²⁵⁹ as discussed below. Simply stated, experimentation involves technical uncertainty about the possibility of developing a system from the start of the project (in the instant case, the filing of the ancestor application). These authorities establish that software development is routine and does not involve experimentation unless it satisfies certain legal requirements. However, in the present case, where an artisan is starting with the disclosed actually reduced-to-practice “experimental system” and other disclosures and where the rejection does not address uncertainty in making or using the invention, there should be no experimentation and certainly not undue experimentation.

The established test for experimentation is technical “uncertainty from the outset” (discussed below). Simply stated, this means technical uncertainty about the possibility of developing the product from the start of the project. In this case, the start of the project is the instant disclosure including the disclosed actually reduced-to-practice “experimental system”.

The issue here is whether an artisan; starting with the disclosed actually reduced-to-practice “experimental system”, the additional disclosure in the instant application, and the skill in the art; would be enabled to make and use the claimed invention. This starting point is the “outset”. The test, according to the law on experimentation, is whether an artisan making and using the claimed invention in this environment would be “uncertain at the outset.”

The conclusion in this case must be that, “at the outset”, it was not uncertain that an artisan would be enabled to make and use the claimed invention. Starting with the disclosed actually reduced-

²⁵⁸ Ex parte Hyatt, Appeal No. 532-38, Paper No. 32 at 2-3 in patent application Serial No. 05/948,053 (PTO Bd. App. April 20, 1984) [herein Hyatt-'053] (unpublished PTO decision).

²⁵⁹ Norwest Corporation and Subsidiaries v. Commissioner of Internal Revenue, 110 TC 454, 507-508 (1998); WICOR, Inc., and Subsidiaries v. United States, 116 F. Supp. 2d 1028, 1035-36 (E.D. Wis. 2000); United Stationers, Inc. v. United States, 163 F.3d 440, 445-46 (7th Cir. 1998).

to-practice “experimental system”, the additional disclosures in the instant application, and the skill in the art; there should be no question that an artisan would have been enabled to make and use the claimed invention.

7.5.8.2 The Established Law On Experimentation

The established law on the nature of experimentation is articulated by Norwest, WICOR, and United Stationers²⁶⁰ – technical uncertainty about the possibility of developing the product from its outset.

The court in WICOR stated:

The government responds that the WICOR project did not involve developing a new computer system in which the design was uncertain at the outset.

The plaintiff failed to present evidence that the means for achieving the final result of the WICOR project were uncertain at the outset.

116 F. Supp. 2d at 1035.

The plaintiff failed to present evidence that the means for achieving the final result of the WICOR project were uncertain at the outset. For example, Paul Kowalski, the WICOR credit team leader, testified that the WICOR project team followed a tried and true data processing approach – the DB-2 system. Perhaps most telling is Kowalski’s acknowledgment that the data processing system utilized by WICOR was not new, although it was new to WICOR (Kowalski Dep. at pp. 28-29). However, a method does not constitute a process of experimentation simply because the method is experimental to a specific taxpayer. Rather, the method must be experimental to the relevant field – in this case, computer science. Kowalski’s testimony belies the plaintiff’s assertion that the WICOR project was experimental to the field of computer science.

116 F. Supp. 2d at 1035-36.

²⁶⁰ Norwest Corporation and Subsidiaries v. Commissioner of Internal Revenue, 110 TC 454, 507-508 (1998); WICOR, Inc., and Subsidiaries v. United States, 116 F. Supp. 2d 1028, 1035-36 (E.D. Wis. 2000); United Stationers, Inc. v. United States, 163 F.3d 440, 445-46 (7th Cir. 1998).

The court is persuaded by the testimony offered by the government's experts – Dr. Srivastava and Thomas Niccum – that the project did not involve identification of models or theories of computer science using a process of experimentation and that there was not a systematic research-oriented process by which data was collected for analysis of competing hypotheses. Although WICOR developed “lessons learned” reports, these reports were informal and only identified miscellaneous programming errors. The court concludes that the WICOR project did not constitute a process of experimentation.

116 F. Supp. 2d at 1036.

According to USI's dictionary, an experiment is “... a test, trial, or tentative procedure, an act or operation for the purpose of discovering something unknown or of testing a principle, supposition, etc.” Appellant's Br. at 23 (citing Random House College Dictionary 465 (rev. ed. 1984)).

163 F.3d at 445 (alteration in original).

The legislative history of § 41(d)(1)(C) bolsters this conclusion. The Conference Report explains the meaning of the process of experimentation test: The term process of experimentation means a process involving the evaluation of more than one alternative designed to achieve a result where the means of achieving that result is uncertain at the outset. This may involve developing one or more hypotheses, testing and analyzing those hypotheses (through, for example, modeling or simulation), and refining and discarding the hypotheses as part of a sequential design process to develop the overall component.

Thus, for example, costs of developing a new or improved business component are not eligible for the credit if the method of reaching the desired objective (the new or improved product characteristics) is readily discernible and applicable as of the beginning of the research activities, so that true experimentation in the scientific or laboratory sense would not have to be undertaken to develop, test, and choose among viable alternatives Engineers who design a new computer system, or who design improved or new integrated circuits for use in computer or other electronic products, are engaged in qualified research because the design of those items is uncertain at the outset and can only be determined through a process of experimentation relating to specific design hypotheses and decisions as described above.

163 F.3d at 445-46 (alteration in original).

H.R. Conf. Rep. No. 99-841, at II-72 (1986).... The Report suggests that qualifying research must from its outset involve some technical

uncertainty about the possibility of developing the product. See *Norwest*, 1998 U.S. Tax Ct. LEXIS 32, P 52,758, at 4655 (discussing the “required uncertainty”); cf. *TSR*, 96 T.C. at 920-21.

163 F.3d at 446.

None of the summaries, however, describes any technical uncertainty about actually developing the programs. Compare *Norwest*, 1998 U.S. Tax Ct. LEXIS 32, P 52,758, at 4670 (programming project did not constitute qualified research because, in part, it did not involve technical risk). Nor were there any doubts about the ability of computers to perform the invoicing, billing and marketing tasks. That is, there was simply no technical uncertainty from the outset. We therefore conclude that USI’s development of the eight programs did not involve a process of experimentation and that the district court did not clearly err in concluding that the projects did not involve the level of uncertainty necessary to clear this hurdle.

163 F.3d at 446.

D. THE PROCESS OF EXPERIMENTATION TEST

The process of experimentation test requires that substantially all of the activities which constitute elements of a process of experimentation relate to a new or improved function, performance, reliability, or quality. The process of experimentation test, which is referenced in the discovery test, is explained by Congress as follows:

The term process of experimentation means a process involving the evaluation of more than one alternative designed to achieve a result where the means of achieving that result is uncertain at the outset. This may involve developing one or more hypotheses, testing and analyzing those hypotheses (through, for example, modeling or simulation), and refining or discarding the hypotheses as part of a sequential design process to develop the overall component.

110 T.C. at 495-96.

Thus, for example, costs of developing a new or improved business component are not eligible for the credit if the method of reaching the desired objective (the new or improved product characteristics) is readily discernible and applicable as of the beginning of the research activities, so that true experimentation in the scientific or laboratory sense would not have to be undertaken to develop, test, and choose among the viable alternatives.

110 T.C. at 496.

Unlike the regulations under section 174, which are silent about the means of discovering information, the conference report accompanying the TRA 1986 made it clear that a more structured method of discovery is required with respect to section 41. By requiring that at the outset uncertainty exist about the ability to develop the product in the scientific or laboratory sense, the process of experimentation test is aimed at eliminating uncertainty about the TECHNICAL ability to develop the product -- as opposed to uncertainty as to whether the product can be developed within certain business or economic constraints, even though the taxpayer knew that it was technically possible to develop it.

110 T.C. at 496.

As evidence of the required uncertainty, Congress mandated the evaluation of more than one alternative, which in turn may require the use of a structured process of experimentation through the continuous development of hypotheses that require testing and analysis until the method for reaching the objective is discovered. Congress did not specify that any particular number of hypotheses be developed by the taxpayer, but the more hypotheses that are developed, tested, and analyzed, the more likely the project will satisfy the process of experimentation test.

110 T.C. at 496.

This test also requires that “substantially all” of the activities constitute elements of a process of experimentation. This requirement raises two questions: (1) What does the term “substantially all” mean? and (2) what activities come within the elements of a process of experimentation?

We agree with respondent and hold that in the context of section 41, the term “substantially all” refers to at least 80 percent of the activities that constitute elements of a process of experimentation. This interpretation is consistent with the existing definition of “substantially all” in the regulations under section 41 with respect to qualified wages.

110 T.C. at 497.

Congress indicated in the conference report accompanying the TRA 1986 those elements which constitute a process of experimentation. They include the developing, testing, and analyzing of hypotheses. They do not include activities performed after commercial production or implementation or otherwise set forth in section 41(d)(4). See H. Conf. Rept. 99-841 (Vol. II), *supra* at II- 72, 1986-3 C.B. (Vol. 4) at 72. However, in the case of internal use software,

exceptions are made for the modifications of commercially available software. See *infra*.

Thus, at least 80 percent of the activities engaged in by a taxpayer with respect to the preproduction or implementation development of a product must involve the development, testing, and analysis of hypotheses that are designed to eliminate technical uncertainty as to the development of that product. This then raises the issue of which activities in a project are to be examined together and which are to be examined separately for purposes of section 41.

110 T.C. at 497.

In that regard, the court found that the taxpayer did not expand or refine existing principles of computer science, stating: "Rather, Stationers merely applied, modified, and at most, built upon, pre-existing, technological information already supplied to it. This is a far-cry from what Congress contemplated when it spoke of research directed at the 'principles of computer science'." 982 F.Supp. at 1284.

110 T.C. at 502.

7.5.8.3 The Electronics And Programming Arts Are Very Predictable

It is black-letter law that the electronics and programming arts were very predictable. See the law cited below.

As we explained in *In re Fisher*, 57 CCPA at 1108, 427 F.2d at 839, 166 USPQ at 24:

In cases involving predictable factors, such as mechanical or electrical elements, a single embodiment provides broad enablement in the sense that, **once imagined**, other embodiments can be made **without difficulty** and their performance characteristics **predicted** by resort to known scientific laws. In cases involving unpredictable factors, such as most chemical reactions and physiological activity, the scope of enablement obviously varies inversely with the degree of unpredictability of the factors involved.

Bowen.²⁶¹

²⁶¹ In re Bowen, 492 F.2d 859, 181 USPQ 48, 50 (CCPA 1974) (emphasis added).

In cases involving predictable factors, such as mechanical or electrical elements, a single embodiment provides enablement in the sense that, once imagined, other embodiments can be made without difficulty and their performance characteristics predicted by resort to known scientific laws. In cases involving unpredictable factors, such as most chemical reactions and physiological activity, the scope of enablement obviously varies inversely with the degree of unpredictability of the factors involved.

In re Fisher, 427 F.2d 833, 166 USPQ 18, 24 (CCPA 1970)

“We adhere to what was there said [in In re Fisher] concerning the high level of predictability in mechanical or electrical environments and the lower level of predictability expected in chemical reactions and physiological activity.”

Hormone Research Foundation Inc. v. Genentech Inc., 904 F.2d 1558, 15 USPQ2d 1039, 1048

(Fed. Cir. 1990) (quoting In re Hogan, 559 F.2d 595, 606, 194 USPQ 527, 537-38 (CCPA 1977)).

In In re Fisher . . ., this court set forth the basic considerations respecting enablement and the potential for domination of future developments, describing the effect of predictability factors upon those considerations. We adhere to what was there said concerning the high level of predictability in mechanical or electrical environments and the lower level of predictability expected in chemical reactions and physiological activity.

In re Hogan, 559 F.2d 595, 194 USPQ 527, 537-38 (CCPA 1977).

Further with respect to the prima facie case of non-enablement, we note that a single embodiment may provide broad enablement in cases involving predictable factors, such as mechanical or electrical elements.

Hitzemann.²⁶²

The scope of the required enablement varies inversely with the degree of predictability involved, but even in unpredictable arts, a

²⁶² Ex parte Hitzeman, 9 USPQ2d 1821, 1823 (Bd. Pat. App. & Int. 1988) (emphasis added).

disclosure of every operable species is not required. A single embodiment may provide broad enablement in cases involving predictable factors, such as mechanical or electrical elements. *In re Vickers*, 141 F.2d 522, 526-27, 61 USPQ 122, 127 (CCPA 1944); *In re Cook*, 439 F.2d 730, 734, 169 USPQ 298, 301 (CCPA 1971).

MPEP 2164.03 (emphasis added). The PTO presents its definition for “predictability” in MPEP 2164.03:

The “predictability or lack thereof” in the art refers to the ability of one skilled in the art to extrapolate the disclosed or known results to the claimed invention. If one skilled in the art can readily anticipate the effect of a change within the subject matter to which the claimed invention pertains, then there is predictability in the art.

It is well established that the electronic art is highly predictable:

Where, as here, a claimed genus represents a diverse and relatively poorly understood group of microorganisms, the required level of disclosure will be greater than, for example, the disclosure of an invention involving a “predictable” factor such as a mechanical or electrical element.

Vaeck.²⁶³; see also MPEP 2164.03.

Furthermore, the programming art is as predictable as the electrical art:

“[it is a] fundamental and well understood tenet of the computing art [that] ... ‘[a]ny software process can be transformed into an equivalent hardware process, and any hardware process can be transformed into an equivalent software process.’” See Ed Klingler [sic, Klingman], *Microprocessor Systems Design* 5 (1977). Dr. Rhyne stated that this “dualistic transformation,” known as the “hardware-/software” tradeoff, effectively means that the selection of a software pointer for a microprocessor versus a hardware switch to control a microprocessor-based system is simply a matter of design choice. This record evidence shows that one of skill in the art would recognize these alternative systems as interchangeable substitutes.

Overhead Door.²⁶⁴

²⁶³ *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438, 1445 (Fed. Cir. 1991).

²⁶⁴ *Overhead Door v. Chamberlain*, 194 F.3d 1261, 52 USPQ2d 1321, 1326 (Fed. Cir. 1999) (emphasis added).

As an example, the early 1980s saw third generation microcomputers (the Intel 80286 microcomputer), the second generation Apple computers (the Apple Macintosh personal computer), and the second generation IBM personal computer (the IBM AT personal computer). See Section 9.3.²⁶⁵

7.5.8.4 Routine Software Development Does Not Involve “Experimentation”

“[R]outine software development” does not involve experimentation. This is particularly significant in view of the disclosed actually reduced-to-practice “experimental system” and other disclosures and the predictability of the programming art. See Section 5.7. See also Sections 7.3.10, 7.3.16, 7.5.8, and 7.5.10.

The U.S. Supreme Court set the stage in Loom.²⁶⁶

The specification ... proceeds to describe the mechanism of the invention by a description and reference to drawings ... all which would be incomprehensible to a person unacquainted with looms for weaving pile fabrics, but very plain to one who understood their construction and operation at the date of the patent. A person skilled in the art of constructing or using such looms ... would readily appreciate the meaning of the terms and the character of the improvement described....

When an astronomer reports that a comet is to be seen with the telescope in the constellation of Auriga, in so many hours and minutes of right ascension, it is all Greek to the unskilled in science; but other astronomers will instantly direct their telescopes to the very point in the heavens where the stranger has made his entrance into our system. They understand the language of their brother scientist. If a mechanical engineer invents an improvement on any of the appendages of a steam engine ... he is not obliged, in order to make himself understood, to describe the engine, nor the particular appendage to which the improvement refers, nor its mode of connection with the principle machine. These are already familiar to others skilled in that kind of machinery. He may begin at the point where his invention begins, and

²⁶⁵ See, e.g.; The Computer History Museum – Timeline available at http://www.computerhistory.org/timeline/timeline.php?timeline_category=cmptr (last visited June 1, 2005).

²⁶⁶ Loom Co. v. Higgins, 105 U.S. 580, 585 (1881) (emphasis added).

describe what he has made that is new, and what it replaces of the old.
**That which is common and well known is as if it were written out
 in the patent and delineated in the drawings.**

Similarly, because computer program knowledge “is common and well known [it] is as if it were written out in the patent and delineated in the drawings.”

The CCPA in Sherwood then applied this century-old U.S. Supreme Court wisdom to computer programming:²⁶⁷

In general, writing a computer program may be a task requiring the most sublime of the inventive faculty or it may require only the droning use of a clerical skill. The difference between the two extremes lies in the creation of mathematical methodology to bridge the gap between the information one starts with (the “input”) and the information that is desired (the “output”). If these bridge-gapping tools are disclosed, there would seem to be no cogent reason to require disclosure of the menial tools known to all who practice this art.

In assessing any computer-related invention, it must be remembered that the programming is done in a computer language. The computer language is not a conjuration of some black art, it is simply a highly structured language. Analogously, if a person were to express a complete thought in German, it would be no trick for a translator to convert that thought into a palpable English form. The thought, thus expressed, might not be worthy of Shakespeare, but it would be understandable to one who uses the English language. Similarly, the conversion of a complete thought (as expressed in English and mathematics, i.e., the known input, the desired output, the mathematical expressions needed and the methods of using those expressions) into the language a machine understands is necessarily a mere clerical function to a skilled programmer.

Taking into account the expert opinions found in the two affidavits, it would appear that the detailed disclosure of the analog method in combination with the suggestion that a digital method should be used might be more enlightening to one having ordinary skill in the art than the computer listing or flow chart required by the PTO. We view the PTO’s requirement as quite formalistic in view of the verbal flow chart provided by appellant in the specification. In any event, the touchstone is the content, not its form.

²⁶⁷ In Re Sherwood, 613 F.2d 809, 204 USPQ at 544, 544 n.6, and 544-545 n.8, respectively (CCPA 1980).

The Federal Circuit in Robotic Vision²⁶⁸ held that software does not have to be disclosed to be enabling, even undisclosed software can be enabling if it is apparent to an artisan or implicit in the disclosure. Thus, the instant disclosed software and computer functions must certainly be enabled.

The Federal Circuit in Fonar cited to Sherwood with approval and elaborated on software disclosure regarding written description, enablement, and experimentation -- the disclosure does not need to disclose flow charts or computer source code listings, “a disclosure of the functions of the software” is adequate:²⁶⁹

GE argues that the patent fails to disclose two software routines....

As a general rule, where software constitutes part of a best mode of carrying out an invention, description of such a best mode is satisfied by **a disclosure of the functions of the software**. This is because, normally, writing code for such software is within the skill of the art, not requiring undue experimentation, once its functions have been disclosed. It is well established that what is within the skill of the art need not be disclosed to satisfy the best mode requirement as long as that mode is described. **Stating the functions of the best mode software satisfies that description test**. We have so held previously and we so hold today. See *In re Hayes Microcomputer Prods., Inc. Patent Litigation*, 982 F.2d 1527, 1537-38, 25 U.S.P.Q. 2D (BNA) 1241, 1248-49 (Fed. Cir. 1992); *In re Sherwood*, 613 F.2d 809, 816-17, 204 U.S.P.Q. (BNA) 537, 544 (CCPA 1980). Thus, **flow charts or source code listings are not a requirement for adequately disclosing the functions of software**. See *Sherwood*, 613 F.2d at 816-17, 204 U.S.P.Q. (BNA) at 544. Here, substantial evidence supports a finding that the software functions were disclosed sufficiently to satisfy the best mode requirements. See *Hayes*, 982 F.2d at 1537, 25 U.S.P.Q. 2D (BNA) at 1248-49 (stating that there was no best mode violation where the specification failed to disclose a firmware listing or flow charts, but did disclose sufficient detail to allow one skilled in the art to develop a firmware listing for implementing the invention).

A finding that the GMB was sufficiently disclosed to satisfy the best mode requirement was also supported by substantial evidence.

²⁶⁸ Robotic Vision Systems, Inc. v. View Engineering Inc., 42 USPQ2d 1619, 1622 (Fed. Cir. 1997).

²⁶⁹ Fonar Corp. v. General Electric Co., 107 F.3d 1543, 41 USPQ2d 1801, 1804-05, (Fed. Cir. 1997) (emphasis added).

Fonar's witness testified that the '966 patent provided a description of the function of the GMB with reference to the components within the dotted line in Figure 7 of the '966 patent, reproduced below.

The MPEP confirms the significant latitude in disclosing software aspects of inventions.²⁷⁰

The claimed invention subject matter need not be described literally, i.e., using the same terms, in order for the disclosure to satisfy the description requirement. Software aspects of inventions may be described functionally. See *Robotic Vision Sys. v. View Eng'g, Inc.*, 112 F.3d 1163, 1166, 42 USPQ2d 1619, 1622-23 (Fed. Cir. 1997); *Fonar Corp. v. General Electric Co.*, 107 F.3d 1543, 1549, 41 USPQ2d 1801, 1805 (Fed. Cir. 1997); *In re Hayes Microcomputer Prods., Inc.*, 982 F.2d 1527, 1537-38, 25 USPQ2d 1241, 1248-49 (Fed. Cir. 1992).

It follows that the functional disclosure of software aspects of inventions are also suitable for enablement.

Similar to the CCPA's position in Sherwood (above), the Federal Circuit established that all that was needed to satisfy § 112-1 for a complex claim directed to a microprocessor-based modem was (1) identification of a commercial microprocessor and (2) a brief description of the function to be performed:

Disclosing a microprocessor capable of performing certain functions is sufficient to satisfy the requirement of section 112, first paragraph, when one skilled in the relevant art would understand what is intended and know how to carry it out....

The disclosure sufficiently recites the function of the firmware.... The evidence supports the conclusion that one of ordinary skill in the art would understand how to implement the timing means with a microprocessor without a firmware listing.... The evidence of record supports the conclusion that all that was required for one of ordinary skill in the art to understand what the invention was and how to carry it out was the disclosure of a microprocessor having certain capabilities and the desired functions it was to perform

Ven-Tel also focuses on the fact that the heart of the claimed invention of the '302 patent is described only in twenty-seven lines. Certainly no length requirement exists for a disclosure to adequately

²⁷⁰ MPEP (Revision 2, May 2004) at § 2106, in discussing compliance with the written description requirement at B.1. (pp. 2100-20, Revision 2, dated May 2004).

describe an invention. While some inventions require more disclosure, the adequacy of the description of an invention depends on its content in relation to the particular invention, not its length.

Hayes.²⁷¹

While we agree that the '302 patent only discloses the general function of the firmware without teaching mathematical formulas, flow charts, or a firmware program listing, no more was needed here.

Hayes.²⁷² The instant disclosure describes "the desired functions it was to perform" in significantly more detail than the 27 line description of the Hayes patent and the instant disclosure expressly teaches a dual 8085-8088 microprocessor arrangement in a commercial CompuPro computer system product:

The computer is implemented with various S-100 boards manufactured by CompuPro including the 8085-8088 CPU board, RAM 16 and RAM 17 memory boards, a System Support board, and a pair of Interfacer 2 boards.... These boards are described in detail in the referenced manuals.

Spec. at 297.

The Federal Circuit in Union Oil²⁷³ cited to Hayes and Vas-Cath with approval stating:

Appellant refiners assert that the specification does not describe the exact chemical component of each combination that falls within the range claims of the '393 patent. However, neither the Patent Act nor the case law of this court requires such detailed disclosure. *See In re Hayes Microcomputer Prods., Inc. Patent Litigation*, 982 F.2d 1527, 1533, 25 USPQ2d 1241, 1245 ("[The applicant] does not have to describe exactly the subject matter claimed."); *Vas-Cath*, 935 F.2d at 1566 ("ranges found in applicant's claims need not correspond exactly to those disclosed in [the specification]; issue is whether one skilled in the art could derive the claimed ranges from the [disclosure].") Rather, the Patent Act and this court's case law require only sufficient description to show one of skill in the refining art that the inventor possessed the claimed invention at the time of filing.

²⁷¹ In re Hayes Microcomputer Products Inc., 982 F.2d 1527, 25 USPQ2d 1241, 1246 (Fed. Cir. 1992) (footnote omitted, emphasis added).

²⁷² In re Hayes Microcomputer Products Inc., 982 F.2d 1527, 25 USPQ2d 1241, 1248 (Fed. Cir. 1992) (emphasis added).

²⁷³ Union Oil Co. of California v. Atlantic Richfield, 208 F.3d 989, 54 USPQ2d 1227, 1233 (Fed. Cir. 2000).

This statement has even greater relevance to the instant case because the Federal Circuit confirmed that, even in the relatively unpredictable chemical art, a disclosure does not have to describe the exact chemical components of a claim combination. Yet the instant claimed invention is in the highly predictable electrical and programming arts and the instant disclosure does describe claim limitations exactly. Because the unexact chemical disclosure in Union Oil was sufficient for that unpredictable art, then the exact disclosures in the instant application are certainly more than sufficient for the highly predictable electrical and programming arts. This notwithstanding the disclosed actually reduced-to-practice “experimental system” and the significant other disclosures.

The Federal Circuit in Northern Telecom²⁷⁴ then further applied the century-old U.S. Supreme Court wisdom (Loom) to computer programming:

Further, experts for both sides testified that an experienced programmer could, without unreasonable effort, write a program to carry out the invention of the '375 patent.

* * *

The great weight of the expert testimony on both sides was that a programmer of reasonable skill could write a satisfactory program with ordinary effort. This requires the conclusion that the programs here involved were, to a skilled programmer, routine.

The instant disclosure even provides source code for computer programs (see the Table of Contents (Section 9.1)):

| | |
|---------------------------------|-----|
| BASIC PROGRAM LISTING GRAPH.ASC | 544 |
| BASIC PROGRAM LISTING LD.ASC | 547 |
| BASIC PROGRAM LISTING FTR.ASC | 561 |
| BASIC PROGRAM LISTING DIS.ASC | 567 |

Other courts -- Norwest, WICOR, and United Stationers (discussed above) -- further refine this century-old U.S. Supreme Court wisdom for computer programming.²⁷⁵

²⁷⁴ Northern Telecom Inc. v. Datapoint Corp., 908 F.2d 931, 15 USPQ2d 1321, 1329-1330, (Fed. Cir. 1990), cert. denied, 498 U.S. 970 (emphasis added).

²⁷⁵ WICOR, Inc., and Subsidiaries v. United States, 116 F. Supp. 2d 1028, 1035 (E.D. Wis. 2000).

Dr. Walter Scacchi [plaintiff's expert] distinguished the engineering method from the scientific, empirical, and analytical methods of experimentation.

Experimentation involves more than simply debugging a computer program.²⁷⁶

The projects fit squarely within this definition, USI claims, because software development involves debugging, a process of testing and correcting computer programs. We find this argument unpersuasive. Debugging programs amounts simply to fine-tuning computer operating instructions. Although we are reluctant to establish bright-line rules – § 41 cases will always be highly fact-intensive – we think that a process of experimentation involves something more than simply debugging a computer program. See *Norwest*, 1998 U.S. Tax. Ct. LEXIS 32, P 52,758, at 4669 (computer programming project did not qualify because it “merely required conducting good coding and eliminating bugs through testing”).

United Stationers at 445.

The court in Norwest stated:²⁷⁷

It is my [Dr. Davis'] opinion based on the sources provided ... that the work performed by Norwest involved normal and routine software development. The software produced, in terms of the products and services provided, and the technology used to support it, was all within the then current state of the art in the industrial work of management information systems. None of the documents provided suggest that any of the software developed by Norwest was, among other things, innovative or involved a significant degree of technical risk....

Dr. Davis described five types of projects associated with software development: (1) Design and implementation (the de novo creation of a body of software); (2) installation and testing (the purchase and installation of software from a vendor); (3) maintenance (ongoing adjustments to the code); (4) enhancement (adding of functionality to the program); and (5) research (attempting to do something for the first time)....

²⁷⁶ United Stationers, Inc. v. United States, 163 F.3d 440, 445 (7th Cir. 1998).

²⁷⁷ Norwest Corporation and Subsidiaries v. Commissioner of Internal Revenue, 110 TC 454, 507 (1998) (asterisks in original).

Dr. Davis stated that routine software development must be distinguished from software research efforts. He contended that software research is characterized by the search for information (as opposed to the production of code) n46 [FN 46: Dr. Davis dismissed Norwest's activities as not qualified research because Norwest produced operational software and not information about principles.]

....

7.5.8.5 The Federal Circuit Held That Software Does Not Even Have To Be Disclosed To Be Enabling, Even Undisclosed Software Can Be Enabling If It Is Apparent Or Implicit In The Disclosure

The Federal Circuit in Robotic Vision²⁷⁸ held that software does not even have to be disclosed to be enabling, even undisclosed software can be enabling if it is apparent to an artisan or implicit in the disclosure. In fact, in Robotic Vision the Federal Circuit held that "software" did not even have to be mentioned to provide an enabling best mode:

On the other hand, the inventors in this case disclosed a device for carrying out their method, and it is plainly apparent that a computer, operating under software control, is to be interfaced to the device for controlling the movement of the sensor. Something must be connected to the device for providing control signals to the motors and for receiving information from the linear encoders concerning a position of the sensor, and there is no dispute that that something is a computer.

The facts support the conclusion that software is to be used.

* * *

It simply states that a software program was the only means contemplated of carrying out the invention. From the record before us, it is clear that a software program was involved in the carrying out of the invention and that no other mode existed.

Moreover, as asserted by Robotic, it would have been apparent to one skilled in the art, knowing that software was used in the prior art system, to use software for implementing the improved scanning method claimed in the patent. Yonescu averred that: "A person of ordinary skill in the art to which the '227 patent pertains would know and understand that software is needed to perform the

²⁷⁸ Robotic Vision Systems, Inc. v. View Engineering Inc., 42 USPQ2d 1619, 1622 (Fed. Cir. 1997).

patented method. The details of such software would also be within the skill of a person of ordinary skill in the art to which the '227 patent pertains." View has not provided a basis for concluding that Yonescu's assertions are not correct. Thus, one cannot conclude that a person skilled in the art would not have known that software was the best mode of carrying out the invention and how to implement it. The patent cannot be held to fail to comply with the best mode requirement for lack of the word "software," the use of which was plainly apparent to one skilled in the art. Such a disclosure was implicit in the specification.

Finally, it has not been shown that there is a genuine issue as to whether one skilled in the art would have known how to create specific source code for this purpose. We have previously held in *Hayes* and in *Fonar* (after the district court decided this case) that when disclosure of software is required, it is generally sufficient if the functions of the software are disclosed, it usually being the case that creation of the specific source code is within the skill of the art. *Fonar Corp. v. General Electric Co.*, Nos. 96-1075, 96-1106, and 96-1091, 1997 WL 76027, at *5 [41 USPQ2d 1801] (Fed. Cir. Feb. 25, 1997); *Hayes*, 982 F.2d at 1537-38, 25 USPQ2d at 1248-49. The functions that software program would instruct the computer to perform for controlling the machine are readily apparent from the specification of the patent at issue here, which describes the scan paths and parameters for full-tray scanning. View has not presented any evidence to controvert Robotic's assertion that one skilled in the art could generate the necessary software program to implement the disclosed functions. We therefore must conclude that the district court erred in granting summary judgment to View that the '227 patent is invalid for failure to disclose the best mode.

A recent law review article discussed the law of the Federal Circuit on the issue of computer and software patent disclosures.²⁷⁹

n87. In recent years, the Federal Circuit has held that software patentees need not disclose source or object code, flowcharts, or detailed descriptions of the patented program. Rather, high-level functional description is sufficient to satisfy both the enablement and best mode doctrines. *See Fonar Corp. v. General Electric Co.*, 107 F.3d 1543, 1549 (Fed. Cir. 1997); *see also Graham & Zerbe*, *supra* note 53, at 96-97; *Mahajan*, *supra* note 66, at 3317. The Federal

²⁷⁹ Cohen, Julie et al, Patent Scope and Innovation In The Software Industry, 89 California Law Review (Jan 2001), Footnote 87.

Circuit reasons that “the conversion of a complete thought ... into a language a machine understands is necessarily a mere clerical function to a skilled programmer.” *Northern Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931, 941-42 (Fed. Cir. 1990) (quoting *In re Sherwood*, 613 F.2d 809, 817 (1980)). Indeed, the Federal Circuit has gone so far as to hold that patentees can satisfy the best mode requirement for inventions implemented in software even though they do not use the terms “computer” or “software” anywhere in the specification. *Robotic Vision Sys., Inc. v. View Eng’g, Inc.*, 42 U.S.P.Q.2d 1619 (Fed. Cir. 1997); *In re Dossel*, 42 U.S.P.Q.2d 1881 (Fed. Cir. 1997). To be sure, in these latter cases it would probably be obvious to one skilled in the art that the particular feature in question should be implemented in software. Still, it is remarkable that the Federal Circuit is willing to find the enablement requirement satisfied by a patent specification that provides no guidance whatsoever on how the software should be written. It is simply unrealistic to think that one of ordinary skill in the programming field can necessarily reconstruct a computer program given no more than the purpose the program is to perform. The Federal Circuit’s peculiar direction in the software enablement cases has effectively nullified the disclosure obligation in software cases.

7.5.8.6 Routine Electronic Hardware Development Does Not Involve Experimentation

All of the significant reasons just discussed regarding why routine software development does not involve experimentation **are equally applicable to routine hardware development**. This is because similar skill in the programming art exists in the electronic hardware design art.

“[it is a] fundamental and well understood tenet of the computing art [that] ... ‘[a]ny software process can be transformed into an equivalent hardware process, and any hardware process can be transformed into an equivalent software process.’” See Ed Klingler, *Microprocessor Systems Design* 5 (1977). Dr. Rhyne stated that this “dualistic transformation,” known as the “hardware-/software” tradeoff, effectively means that the selection of a software pointer for a microprocessor versus a hardware switch to control a microprocessor-based system is simply a matter of design choice. This record evidence shows that one of skill in the art would recognize these alternative systems as interchangeable substitutes.

Overhead Door.²⁸⁰ See also Loom and Sherwood – because electronic hardware knowledge “is common and well known [it] is as if it were written out in the patent and delineated in the drawings” and “[i]f these bridge-gapping tools are disclosed, there would seem to be no cogent reason to require disclosure of the menial tools known to all who practice this art.”

It is well established that the skill in the logic design²⁸¹ art was high as of 1967:

DeGeorge need not disclose all circuit details of a word processor or the like. DeGeorge’s expert witness Tanner, a graduate electrical engineer with years of design experience on word processors, testified that “any logic designer of a normal ability should be able to implement functions given this much description [in the *per se* ‘670 disclosure] about them.” ...

It is undisputed that counters, comparison circuits, and logic circuits for detecting input signals from a word processor were all familiar to those with skill in logic design, and particularly printer control logic design, in 1967. At that time, there was nothing exotic or unique about the logic elements of the TCCPI circuit and how they interfaced with signal generating control circuits in a word processor.

DeGeorge.²⁸² See, e.g.; the instant disclosure at Figs. 6B-6D and 6F-6AH and Spec. at 300-371 for digital circuitry implemented with digital integrated circuits..

7.5.9 The Wands Analysis Confirms Enablement

The Examiner contends lack of enablement and he presents what he contends is a Wands analysis (prior Action at 28-46). However, the Examiner’s so-called Wands analysis is based upon erroneous conclusory statements that do little more than misrepresent the skill in the art (Section 7.5.6), misrepresent the law on enablement (Section 7.5.2), misrepresent the law and the facts on experimentation (Section 7.5.8), disregard the disclosed “working examples” (Section 7.5.10),

²⁸⁰ Overhead Door v. Chamberlain, 194 F.3d 1261, 52 USPQ2d 1321, 1326 (Fed. Cir. 1999) (emphasis added).

²⁸¹ “Logic design” is the design with digital “logic” (e.g.; AND gates, OR gates, NAND gates, and NOR gates) to implement digital devices (e.g.; digital processors).

²⁸² DeGeorge v. Bernier, 768 F.2d 1318, 226 USPQ 758, 762 (Fed. Cir. 1985) (emphasis added).

misrepresent the skill in and the predictability of the electronics and programming arts (Sections 7.5.6.1 and 7.5.8.3), and misrepresent the substance of the disclosure and the disclosed actually reduced-to-practice “experimental system” (Section 5). Therefore, the Examiner is not in a position to even allege experimentation much less undue experimentation.

The Examiner’s contention that he performed a Wands analysis is erroneous – he erroneously contends low skill in the art and then wanders off into irrelevant issues and makes self-serving conclusory statements. However, he does not properly address the eight Wands factors (discussed below) and he certainly does not properly consider the extensive “working examples” in the instant disclosure (Section 7.5.10) that are a very important part of the Wands analysis. Further, the Examiner misrepresents the skill-in-the-art (Section 7.5.6) that is also a very important part of a proper Wands analysis. The Examiner fails to establish the required findings of fact supported by the required “substantial evidence” or supported by proper authorities. Further, the Examiner misrepresents the skill in the art (Sections 7.5.6, and 7.5.9), which is fatal to the enablement rejections.

In effect; the Examiner fails to focus on the eight factors, instead making erroneous and conclusory statements regarding lack of enablement and disregarding the substance of the extensive disclosure. Hence, the contention of undue experimentation is not properly supported and thus the § 112-1 enablement rejections should be reversed.

The eight Wands factors²⁸³ regarding experimentation are addressed in the MPEP at 2164.01(a) through 2164.08. Although the Examiner lists the Wands factors, the lengthy discussion related thereto continues to assert only erroneous and conclusory statements and to misrepresent the disclosure and the skill-in-the-art. Because the Examiner does not provide proper evidence, much less the required “substantial evidence”, the Examiner’s Wands analysis does not establish undue experimentation, but instead establishes enablement.

The Appellant addresses these Wands factors below, which establish that there is no undue experimentation.

²⁸³ In re Wands, 858 F.2d 731, 737, 8 USPQ2d 1400, 1404 (Fed. Cir. 1988).

- a) The breadth of the claims: The Examiner has selected a broad so-called “example” claim. See MPEP 2164.08 (“the only relevant concern should be whether the scope of enablement provided ... is commensurate with the scope of protection sought by the claims.”). See also Moore.²⁸⁴
- b) The nature of the invention²⁸⁵ the Examiner’s selected so-called “example” claim is directed to a computer system.. The invention is in the electrical, computer, and programming arts which were highly predictable as of the effective filing date (Sections 7.5.6.1 and 7.5.8.3).
- c) The state of the prior art: the state of the relevant arts was high (Section 7.5.6). For example, by 1984, the Appellant was able to purchase a computer; operating system software; a Basic programming compiler; a display monitor; a wide range of ICs; and a TV display chip that provided television-type synchronization, blanking, interlace, and other signals to control the display monitor (see the MM5321 IC chip in Fig. 6T and in the Spec. at 366-367); and much more. See also the disclosed actually reduced-to-practice “experimental system” (Sections 5.7 and 7.3.10).
- d) The level of one of ordinary skill: is consistent with the statement of the state of the prior art in item c) above.
- e) The level of predictability in the art: the level of predictability of the relevant arts was high (Sections 7.5.6.1 and 7.5.8.3). This predictability was significantly enhanced by the design, construction, testing, and disclosure of the disclosed actually reduced-to-practice “experimental system” (Sections 5.7 and 7.3.10).
- f) The amount of direction provided by the inventor: the inventor disclosed in detail an actually reduced-to-practice “experimental system” and extensive other disclosures in the format of a top-down end-to-end disclosure (e.g.; Section 5.6). See also the Table of Contents (Section 9.1), the Brief Description Of The Drawings (Spec. at 5-9), and Section 5. The disclosure teaches a theoretical and mathematical basis, through functional discussions, then through hardware and software design and implementation, and then through video tapes demonstrating operation of the actually reduced-to-practice “experimental system”.

²⁸⁴ In re Moore, 439 F.2d 1232, 1236, 169 USPQ 236, 239 (CCPA 1971).

²⁸⁵ MPEP 2164.05(a) establishes that “the nature of the invention” is “the subject matter to which the claimed invention pertains”.

g) The existence of working examples: the inventor disclosed in detail an actually reduced-to-practice “experimental system” and other disclosures (Sections 5 and 7.3.10) and disclosed extensive “working examples” related thereto (Section 7.5.10).

h) The quantity of experimentation needed to make or use the invention based upon the content of the disclosure: according to the law on experimentation (Section 7.5.8.2), no experimentation should be needed and the Examiner has established none. This is further established in view of the high skill in the relevant arts (Sections 7.5.6.1 and 7.5.8.3), the extensive disclosure, and the disclosed actually reduced-to-practice “experimental system” (Sections 5.7 and 7.3.10).

In view of the Appellant’s Wands analysis above and in view of the Examiner’s failure to properly address the Wands factors, the enablement rejections should be reversed.

7.5.10 The Examiner Failed To Properly Address The Many Disclosed “Working Examples”

7.5.10.1 Overview

The many disclosed legal “examples” is a very significant fact for enablement. When this fact is considered in combination with the fact of the disclosed actually reduced-to-practice “experimental system” and other disclosures and the fact of the predictability of the electrical, computer, and programming arts; there should be no question that the disclosure is enabling of the claimed invention (e.g.; Sections 5.7, 7.3.10, and 7.5.6).

The § 112-1 enablement rejections fail to properly address the significant legal “examples” in the instant disclosure despite the fact that the CCPA in *Cavallito* established the importance of such legal “examples”.²⁸⁶

In the case of alloys or mixtures In such cases an applicant, by fixing the ranges of proportions and describing a few examples throughout the range, may enable anyone skilled in the art to make any product covered by the claim, and may inform him as to what properties such a product will have.

²⁸⁶ In re Cavallito and Gray, 282 F.2d 363, 127 USPQ 202, 205 (CCPA 1960) (emphasis added).

The same principle should apply to claims covering a wide range of distinct chemical compounds. However, because of the proportion of unknown compounds it will ordinarily be necessary to give many more examples and much more specific information than would be necessary in the case of an alloy or a mixture.

The significant legal “examples” in the instant disclosure; the predictability of the electrical, computer, and programming arts; and the failure of the Examiner to properly address these important issues are very significant reasons for reversing the § 112-1 rejections. This is even more significant in view of the fact that, in predictable arts such as the electrical, computer, and programming arts, legal “examples” are not even necessary.

The Federal Circuit established that “many” examples are necessary in unpredictable arts, such as the chemical art, to support a range of compounds. Hence, the “many” examples in the instant disclosure, which is in the predictable electrical, computer, and programming arts are certainly helpful and should have been addressed with approval by the Examiner.

There should be no question that “examples” are very helpful, although not necessary, in the highly predictable electrical, computer, and programming arts. Even in the alloy and mixture arts, “by fixing the ranges of proportions and describing a few examples throughout the range may enable anyone skilled in the art to make any product covered by the claim” (emphasis added).²⁸⁷

In the case of alloys or mixtures, however, it is generally apparent how a product of any desired proportions may be produced, and, since the properties of the aggregate ordinarily vary in accordance with the proportions of the ingredients, the characteristics of any aggregate covered by the claim can generally be predicted with reasonable certainty if the properties of typical aggregates are known. In such cases an applicant, by fixing the ranges of proportions and describing a few examples throughout the range, may enable anyone skilled in the art to make any product covered by the claim, and may inform him as to what properties such a product will have.

The CCPA stated with approval that Sichert sets forth “numerous examples”:²⁸⁸

²⁸⁷ In re Cavallito and Gray, 282 F.2d 363, 127 USPQ 202, 205 (CCPA 1960) (emphasis added).

²⁸⁸ In re Sichert, 566 F.2d 1154, 1164, 196 USPQ 209, 217 (CCPA 1977).

Moreover, appellant's specification sets forth numerous examples, many with exact doses and a discussion regarding the method of treatment.

Similarly, the instant disclosure also sets forth "numerous examples".

The disclosure provides many alternate embodiments (e.g.; alternate system embodiments and software and hardware embodiments) which constitute legal "examples". Just as compelling, the term "example" and terms related thereto occur more than 100 times in the disclosure. The disclosed computer source programs alone are extensive "working examples".

The PTO prominently supports "examples" for establishing enablement. The PTO requires examiners to consider "examples" and specifically to comment on "examples" (MPEP 707.07(l)):

707.07(l) Comment on Examples

The results of the tests and examples should not normally be questioned by the examiner unless there is reasonable basis for questioning the results.

However, the Examiner did not properly consider the many "working examples" in the disclosed actually reduced-to-practice "experimental system".

7.5.10.2 The Law On Legal "Examples" Confirms The Significance Of The Actually Reduced-To-Practice "Experimental System"

The instant application provides many "working examples" and the law confirms that such "working examples" help establish enablement (discussed below). The instant disclosure provides many "working examples" in the actually reduced-to-practice "experimental system" in great detail. However, the Examiner has not properly considered the "experimental system" nor the "working examples" related thereto. See Sections 5.7 and 7.5.10. See also Sections 7.3.10, 7.3.16, and 7.5.8.

The disclosed "examples" have significant legal weight in support of enablement. However, the § 112-1 enablement rejections fail to provide the "substantial evidence" required by the Federal Circuit

in Gartside, Kotzab, and Zurko²⁸⁹ and the Examiner has failed to meet the burden imposed by the Federal Circuit in Atlas²⁹⁰:

Use of prophetic examples, however, does not automatically make a patent non-enabling. The burden is on one challenging validity to show by clear and convincing evidence that the prophetic examples together with other parts of the specification are not enabling. Du Pont did not meet that burden here. To the contrary, the district court found that the “prophetic” examples of the specification were based on actual experiments that were slightly modified in the patent to reflect what the inventor believed to be optimum, and hence, they would be helpful in enabling someone to make the invention.

As in Atlas, the Examiner “did not meet that burden here.” Even more significant is the fact that the instant disclosure contains more than 30 sheets of figures and more than 200 pages of verbal description disclosing extensive “working examples” directed to the actually reduced-to-practice “experimental system” (e.g., Spec. at 240-373 and 503-574).

The PTO recognizes with approval “working examples”, “prophetic examples”, and “paper examples” and “[s]imulated or predicted test results” (MPEP 2164.02 and MPEP 608.01(p)).

Compliance with the enablement requirement of 35 U.S.C. 112, first paragraph, does not turn on whether an example is disclosed. An example may be “working” or “prophetic.” **A working example is based on work actually performed** A prophetic example describes an embodiment of the invention based on predicted results rather than work actually conducted or results actually achieved.

MPEP 2164.02 (emphasis added). In the instant disclosure, many of the “examples” were actually performed; e.g., the actually reduced-to-practice “experimental system”; and other “examples” are “based on work actually performed” (e.g., “based on” the actually reduced-to-practice “experimental system”).

The PTO further discusses “examples” with approval (MPEP 608.01(p)):

Simulated or predicted test results and prophetic examples (paper examples) are permitted in patent applications. Working

²⁸⁹ In re Gartside, 203 F.3d 1305, 53 USPQ2d 1769 (Fed. Cir. 2000); In re Kotzab, 217 F.3d 1365, 55 USPQ2d 1313 (Fed. Cir. 2000); and In re Zurko, 258 F.3d 1379, 59 USPQ2d 1693 (Fed. Cir. 2001).

²⁹⁰ Atlas Powder Co. v. E.I. Du Pont De Nemours & Co., 750 F.2d 1569, 1577, 224 USPQ 409, 414 (Fed. Cir. 1984).

examples correspond to work actually performed and may describe tests which have actually been conducted and results that were achieved. Paper examples describe the manner and process of making an embodiment of the invention which has not actually been conducted.

The Federal Circuit in Regents of Univ. of Cal. approved of characterizing “prophetic examples” as equivalent to “constructive examples”.²⁹¹

Specifically, UC argues that a constructive or prophetic example in the '525 specification describes in sufficient detail how to prepare the claimed organism.

The law does not require “examples” but the PTO often finds “examples” to be very significant. The PTO cites with approval to Borkowski.²⁹²

However, as we have stated in a number of opinions, ... a specification need not contain a working example if the invention is otherwise disclosed in such a manner that one skilled in the art will be able to practice it without an undue amount of experimentation.

Similarly, in the instant application, “examples” are not necessary but the many “examples” that are disclosed are very significant support for enablement. This is particularly so in view of the Borkowski invention being in the relatively unpredictable chemical art while the instant claimed invention is in the predictable electrical art and is in the high skill arts of computers and computer programs.

The disclosure itself establishes that many of the “examples” are “based upon” the disclosed actually reduced-to-practice “experimental system”. For example, the sections disclosing various “DISPLAY APPLICATIONS” (Spec. at 439-491) and the sections disclosing various “NON-DISPLAY APPLICATIONS” (Spec. at 492-502) are disclosed as being based upon the image processing system of the present invention.²⁹³

²⁹¹ Regents of Univ. of Cal. v. Eli Lilly & Co., 119 F.3d 1559, 43 USPQ2d 1398, 1404 (Fed. Cir. 1997).

²⁹² In re Borkowski, 422 F.2d 904, 164 USPQ 642 (CCPA 1970) (footnote omitted) cited in MPEP 707.07(l) entitled “Comment on Examples”.

²⁹³ The Table of Contents for these sections and the subsections contained thereunder are excerpted and quoted above and are further set forth in the complete Table of Contents.

7.5.10.3 The Disclosed Actually Reduced-To-Practice “Experimental System” Teaches Extensive “Working Examples”

The Appellant developed, designed, constructed, programmed, and demonstrated the disclosed actually reduced-to-practice “experimental system”. This “experimental system” includes many “working examples” (Sections 5.7 and 7.5.10). Many of the “working examples” are directly related to the claim limitations. For example, the disclosed actually reduced-to-practice “experimental system” includes computer disclosures. However, the Examiner has disregarded the substance of these very relevant disclosures.

7.5.10.4 The Disclosure Includes Many “Examples”

The instant application provides many “working examples” and the law confirms that these “working examples” help establish enablement. Many of the “working examples” are related to the disclosed actually reduced-to-practice “experimental system”. These “working examples” include software “working examples”, hardware “working examples”, and “working examples” that are combinations of hardware and software.

Many additional examples – “prophetic examples”, “paper examples”, “constructive examples”, and the like – are disclosed in addition to the “working examples” in the instant application.²⁹⁴ Such examples have special significance in a patent proceeding.

Because the instant application provides many “working examples” regarding the disclosed actually reduced-to-practice “experimental system”, other disclosed embodiments are enabled for the reason that their properties can readily be predicted from the “working examples”. This even without considering the facts (a) that the electrical, computer, and programming arts are highly predictable, (b) that the other disclosed embodiments have enabling disclosures, and (c) that the other disclosed embodiments include further “examples” to supplement the “working examples”.²⁹⁵

²⁹⁴ For convenience of discussion, the legal term “example”; such as in “working example”, “prophetic example”, “paper example”, and “constructive example”; are shown in quotation marks while the general form of the term example, such as in -- for example -- are shown without quotation marks.

²⁹⁵ In re Cavallito and Gray, 282 F.2d 363, 127 USPQ 202, 204-205 (CCPA 1960) (emphasis added).

Claims are commonly allowed for alloys or mixtures which permit substantial variations in the proportions of two or more ingredients. Theoretically an infinite number of products may be produced falling within the scope of such a claim. In the case of alloys or mixtures, however, it is generally apparent how a product of any desired proportions may be produced, and, since the properties of the aggregate ordinarily vary in accordance with the proportions of the ingredients, the characteristics of any aggregate covered by the claim can generally be predicted with reasonable certainty if the properties of typical aggregates are known. In such cases an applicant, by fixing the ranges of proportions and describing a few examples throughout the range, may enable anyone skilled in the art to make any product covered by the claim, and may inform him as to what properties such a product will have.

Because “a few examples” enable ranges of products in the alloy and mixture arts, certainly the extensive disclosure and specific “examples” (not just “ranges”) enable the instant claim limitations. This is even more significant because the electrical, computer, and programming arts are even more predictable than the alloy and mixture arts.

The Table of Contents (Section 9.1) and the sections listed provide many “examples” of display and non-display applications:

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The video tapes showing operation of the disclosed actually reduced-to-practice “experimental system” and the discussions related thereto in the disclosure (Spec. at 145-150, “Experimental System Video Tape”) provide many additional “working examples”.

The disclosure itself establishes that many of the “examples” are “based upon” the disclosed actually reduced-to-practice “experimental system”. For example, the sections disclosing various “DISPLAY APPLICATIONS” (Spec. at 439-491) and the sections disclosing various “NON-DISPLAY APPLICATIONS” (Spec. at 492-502) are disclosed as being “based upon” the image processing system of the present invention.²⁹⁶

DISPLAY APPLICATIONS

General

Display applications for **the image processing disclosed herein** are many and varied. Most display applications currently satisfied with CG and CIG systems can use **the present image processing system of the present invention**

Most display applications needing image processing capability can use **the present image processing system of the present invention**. These image processing applications include medical image processing, video special effects, and many others....

The system of the present invention can be used for training of personnel, such as a simulator; as a display for a vehicle, such as for an aircraft cockpit display; for investigation and evaluation of large dynamic range database information, such as with LANDSAT images; and for many other applications.

Spec. at 439-440 (bold emphasis added).

²⁹⁶ The Table of Contents for these sections and the subsections contained thereunder are excerpted and quoted above and are further set forth in the complete Table of Contents.

NON-DISPLAY APPLICATIONS

General Description

Various applications of **the system of the present application** are non-display applications; such as automatic pattern recognition, robotics, and artificial intelligence applications.

Spec. at 492-493 (bold emphasis added).

7.5.10.5 The Examiner Violated The PTO Requirements Regarding “Examples”

The PTO prominently supports “examples” for establishing enablement. The PTO requires examiners to consider “examples” and specifically to comment on “examples” (MPEP 707.07(l)):

707.07(l) Comment on Examples

The results of the tests and examples should not normally be questioned by the examiner unless there is reasonable basis for questioning the results.

However, the instant Examiner did not properly consider the “working examples” that are disclosed in the actually reduced-to-practice “experimental system”. Hence, for this reason alone, the § 112-1 rejections should be reversed.

7.5.11 The Examiner Misrepresents The Law On Enablement With Ghiron, Gunn, And Scarbrough

The Examiner cites to the CCPA decisions in Ghiron, Gunn, and Scarbrough²⁹⁷ (prior Action at 49-55). The Examiner certainly must know the PTO position on Ghiron and Gunn but misrepresents it (discussed below). The MPEP 2106.02 states (emphasis added):

[I]f such practice [practicing the invention] requires **a particular apparatus**, it is axiomatic that the application must therefore provide a sufficient disclosure of **that apparatus** if such is not already available.

²⁹⁷ See In re Ghiron, 442 F.2d 985, 991, 169 USPQ 723, 727 (CCPA 1971); In re Gunn, 537 F.2d 1123, 1128, 190 USPQ 402, 406 (CCPA 1976); and In re Scarbrough, 182 USPQ 298 (CCPA 1974).

See In re Ghiron, 442 F.2d 985, 991, 169 USPQ 723, 727 (CCPA 1971) and In re Gunn, 537 F.2d 1123, 1128, 190 USPQ 402, 406 (CCPA 1976).

However, the issue in the instant enablement rejections is the disclosure of interconnections and interrelations, not the disclosure of “a particular apparatus”. Therefore, Ghiron, Gunn, and Scarborough are not relevant to the instant enablement rejections.

Further, there are many years of additional skill in between the effective filing dates of Ghiron, Gunn, and Scarborough and the effective filing date of the instant application. The effective filing date of Ghiron is 1966, the effective filing date of Gunn is 1971, and the effective filing date of Scarborough is 1968; an average of about 15 years of increase in the skill in the fast growing electronics and computer art to get to the effective filing date of the instant application. In this about 15 years of progress, there was a significant increase in the skill in the computer art. The late 1960s saw the core memory-based minicomputers while the early 1980s saw third generation microcomputers (the Intel 80286 microcomputer), the second generation Apple computers (the Apple Macintosh personal computer), and the second generation IBM personal computer (the IBM AT personal computer).²⁹⁸

Apple Computer launched the Macintosh, the first successful mouse-driven computer with a graphic user interface, with a single \$1.5 million commercial during the 1984 Super Bowl. Based on the Motorola 68000 microprocessor, the Macintosh included many of the Lisa’s features at a much more affordable price: \$2,500.

* * *

IBM released its PC Jr. and PC-AT. The PC Jr. failed, but the PC-AT, several times faster than original PC and based on the Intel 80286 chip, claimed success with its notable increases in performance and storage capacity, all for about \$4,000. It also included more RAM and accommodated high-density 1.2-megabyte 5 1/4-inch floppy disks.

Thus, the skill in the art-related issues in these three cases do not apply to the instant application.

The Examiner, under the camouflage of Ghiron, Gunn, and Scarborough, then develops his own holding and attributes it to the three CCPA decisions. This is improper, the CCPA decisions cannot be

²⁹⁸ See, e.g.; The Computer History Museum – Timeline available at http://www.computerhistory.org/timeline/timeline.php?timeline_category=cmptr (last visited June 1, 2005) and see Section 9.3.

expanded upon by the Examiner to apply to all parts of the disclosures in the subject Ghiron, Gunn, and Scarborough applications. The CCPA decisions regarding a particular undisclosed “apparatus” cannot be expanded upon by the Examiner to cloud the disclosure of all parts and all software of all computer system applications as the technology advances.

The Examiner misrepresents the instant disclosure in order to attempt to force it into the issues in Ghiron, Gunn, and Scarborough (prior Action at 49-50):

The applicant’s disclosed system requires a specific “architecture” under software control and configuration as described above. This is similar to the situation faced by the *In re Ghiron* court....

Third, in Ghiron, “the method cannot be performed by a general purpose computer of the prior art” as described in the decision page 728. This is similar to applicant’s disclosure, which requires specific image processing “architecture”.

However, these are further misrepresentations based on no more than the Examiner’s self-serving conclusory statements. For example, the Examiner inconsistently admits to the fact that the disclosure does not require “a specific ‘architecture’” (instant Action at 6 (emphasis added)):

The disclosed invention appears to be several generalized image processing architectures having numerous optional capabilities.

See also Section 7.3.12. Further, most of the claims are not specific to any particular type of computer, the Appellant’s computer can be replaced by “a general purpose computer of the prior art”. In effect, the actually reduced-to-practice “experimental system” disclosed in the instant application includes a commercially available computer, commercially available operating system software, commercially available input and output circuit boards, and commercially available computer peripherals (e.g.; Spec. at 296-299). See also Spec. at 297:

The computer is implemented with various S-100 boards manufactured by CompuPro including the 8085-8088 CPU board

Other well known commercially available computers or custom computers are taught for alternate configurations (e.g.; Spec. at 41-42):

In a digital image processor configuration, General purpose processors, such as a stored program computer and a microcomputer, can be used for a software implementation and a firmware

implementation respectively. For example, an AMD 2900 bit-slice microprocessor, can be used for a firmware implementation....

In an analog configuration,

In a hybrid configuration,

The Examiner quotes Ghiron about “appellant’s bare allegation” regarding “rectangles of appellant’s drawings” (prior Action at 51). However, the instant application has much more disclosure than that, including commercially available devices, an actually reduced-to-practice “experimental system” embodiment, detailed schematic diagrams and source code software, and even video tapes of operation (Sections 5.6, 5.7, 7.3.7, 7.3.9, 7.3.10, 7.3.11, 7.3.15, 7.5.4, 7.5.5, 7.5.6, 7.5.8, 7.5.9, and 7.5.10).

In the Examiner’s discussion of Scarborough and Gunn he again misrepresents the instant disclosure. As above, the instant application has much more disclosure than Scarborough and Gunn and much more than the Examiner will admit to including commercially available devices, an actually reduced-to-practice “experimental system” embodiment, detailed schematic diagrams and source code software, and even video tapes of operation (see above section cites).

Further, the Examiner misrepresents Fig. 1A as if it stands alone as a mere block diagram. But Fig. 1A is the top of the top-down disclosure which is then disclosure in great detail with more detailed block diagrams, with software (both source code and verbal flow diagrams), with hardware including schematics and verbal descriptions, and with much much more (e.g.; Section 5.6).

7.5.12 The Examiner Misrepresents The Law On Enablement With Wright

The Examiner misrepresents Wright (prior Action at 55-57).²⁹⁹ Wright is related to a chemical technology that is relatively unpredictable while the instant application is directed to the highly predictable computer and electrical arts (Sections 7.5.6.1 and 7.5.8.3).

The Examiner misrepresents the instant disclosure in order to attempt to force it into the issues in Wright (prior Action at 56-57):

While the nature of the subject matter disclosed and claimed by Wright is different from that of the applicant, the similarities between the

²⁹⁹ In re Wright, 999 F.2d 1557, 27 USPQ2d 1510 (Fed. Cir. 1993).

two are as follows. Similar to Wright, the applicant's specification must have provided enabling support as of the effective filing date; in the applicant's case, in the year of 1984. Also similar to Wright, the applicant's description is "general". That is, the applicant discloses a generalized image processing system as described in the rejection above. However, in the applicant's case, there are NO working examples of ANY of the claimed subject matter. Furthermore, the applicant's disclosure is nothing more than an "invitation to experiment" (discussed in the next section below).

The examiner has come to essentially the same conclusion regarding the applicant's disclosure. That is, one of ordinary skill in the art would have had to engage in undue experimentation in 1984 to practice the subject matter of the currently pending claims, given their breadth, the unpredictability in the art, and the limited guidance that the applicant provides in his application, and the applicant has failed (to this point) to establish that the general description of his invention set forth in his application was anything more, in 1984, than an invitation to experiment. **The Wright decision is presented herein as evidence that the rejection advanced herein is reasonable and appropriate given the circumstances facing the examiner, and to reinforce that fact that the applicant's specification must have been enabling as of the effective filing date.**

However, the instant disclosure is not merely "a generalized image processing system" and has much much more than "limited guidance that the applicant provides in his application" but provides a very detailed disclosure with an actually reduced-to-practice "experimental system" embodiment (e.g.; Section 5). The instant disclosure has extensive "working examples" that are very relevant to the claims (Sections 5.7 and 7.5.10). The claims are not "an invitation to experiment" but involve little if any experimentation and certainly not undue experimentation (Section 7.5.8). The Examiner misrepresents the predictability in the art (Sections 7.5.6.1 and 7.5.8.3).

7.6 ARGUMENTS COMMON TO BOTH THE 35 USC § 102 ANTICIPATION REJECTIONS AND THE 35 USC § 103 OBVIOUSNESS REJECTIONS

7.6.1 Introduction

Various claims stand rejected under 35 USC § 102 (“§ 102”) regarding anticipation and various other claims stand rejected under 35 USC § 103 (“§ 103”) regarding obviousness. The Appellant traverses both the § 102 anticipation rejections and the § 103 obviousness rejections for the common arguments set forth in this Section 7.6. The Appellant further traverses the § 102 anticipation rejections for the arguments set forth in Section 0 to supplement the arguments set forth in this Section 7.6. The Appellant further traverses the § 103 obviousness rejections for the arguments set forth in Section 7.8 to supplement the arguments set forth in this Section 7.6.

The art rejections do not, and in fact cannot,³⁰⁰ establish a prima facie case of either anticipation or obviousness.

7.6.2 The Art Rejections Do Not Even Provide A Proper Claim-By-Claim Analysis, Much Less The Limitation-By-Limitation Analysis Required By The Federal Circuit

The Federal Circuit requires that art rejections be supported on a limitation-by-limitation basis with specific fact findings for each contested limitation and satisfactory explanations for such findings. The claim construction used in contesting the contested limitations **must** also be explicit. The Federal Circuit also **requires** fact findings, adequately explained, for each relevant factor.³⁰¹ However, the instant art rejections fail to meet these requirements. **The art rejections do not even provide a proper claim-by-claim analysis, much less a proper limitation-by-limitation analysis** (Sections 7.7.4 and 7.8.9).

³⁰⁰ The Examiner cannot establish a prima facie case of either anticipation or obviousness because the prior art references do not anticipate the claims nor render the claims obvious.

³⁰¹ Gechter v. Davidson, 43 USPQ2d 1030, 1935 (Fed. Cir. 1997).

The § 103 rejections fail to meet the requirements of the Federal Circuit. The court, in Gechter³⁰², defined the requirements for a proper rejection which included a requirement that patentability analyses be conducted on a limitation by limitation basis. The court, in Gechter, summarized its position as follows:

In sum, we hold that the Board is required to set forth in its opinions specific findings of fact and conclusions of law adequate to form a basis for our review. In particular, we expect that the Board's anticipation analysis be conducted on a limitation by limitation basis, with specific fact findings for each contested limitation and satisfactory explanations for such findings. [FN3 omitted] Claim construction must also be explicit, at least as to any construction disputed by parties to the interference (or an applicant or patentee in an ex parte proceeding).

Gechter.³⁰³

Gechter expressly applies to § 103 rejections as well as to § 102 rejections.

While not directly presented here, obviousness determinations, when appropriate, similarly must rest on fact findings, adequately explained, for each of the relevant obviousness factors in the Supreme Court's decision in Graham, 383 U.S. at 17-18, 148 USPQ at 467, and its progeny in this court, see, e.g., Loctite, 781 F.2d at 872, 228 USPQ at 97.

Gechter.³⁰⁴ However, the instant § 103 rejections fail to meet these requirements. The § 103 rejections do not even provide a proper claim-by-claim analysis, much less the required limitation-by-limitation analysis.

This is black-letter law going back 30 years to the CCPA. Royka³⁰⁵ established that the prior art must teach or suggest **all claim limitations** to support a § 103 rejection. See also MPEP 2143.03. Wilson³⁰⁶ established that a § 103 rejection must consider **all disputed words in the disputed claims**. See also MPEP 2143.03.

³⁰² Gechter v. Davidson, 116 F.3d 1454, 43 USPQ2d 1030, 1035 (Fed. Cir. 1997).

³⁰³ Gechter v. Davidson, 116 F.3d 1454, 43 USPQ2d 1030, 1035 (Fed. Cir. 1997).

³⁰⁴ Gechter v. Davidson, 116 F.3d 1454, 43 USPQ2d 1030, 1035 FN3 (Fed. Cir. 1997).

³⁰⁵ In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).

³⁰⁶ In re Wilson, 424 F.2d 1382, 165 USPQ 494, 496 (CCPA 1970).

In addition, the CCPA, in reversing a prior art rejection, ruled that **all words** in a claim must be considered in evaluating patentability regarding the prior art.

In this respect, the section 102 rejection in this case is not unlike the section 103 rejection which we reversed in In re Wilson, 57 CCPA 1029, 424 F.2d 1382, 165 USPQ 494 (1970), and is unsupportable for the same reason: “All words in a claim must be considered in judging the patentability of that claim against the prior art” (emphasis added). Id. at 1032, 424 F.2d at 1385, 165 USPQ at 496.

Miller³⁰⁷ (emphasis in original).

In violation of the aforementioned black letter law, the Examiner did not consider all disputed words, elements, and limitations in the rejected claims. Hence, the Examiner violated Gechter and Warner-Jenkinson by failing to support the art rejections on the required limitation-by-limitation basis.

The Examiner did not properly perform a Gechter analysis on a single claim. Further, the Examiner did not properly consider the scope and meaning of each claim limitation as required by Gechter. Further, the Examiner merely identified elements in the references upon which certain claim elements allegedly read. The Examiner did not even perform a single Gechter analysis regarding the different names and different functions of these elements. The Examiner did not make any specific fact findings for each contested limitation, nor provide a satisfactory explanation, nor provide a proper claim construction for the disputed claim limitations as required by Gechter. The Examiner did not even acknowledge that some of the limitations in the claims have different names and functions than the elements with which they are compared.

The court in Gechter commented that if claim construction is not explicit or if the claims were misconstrued, a finding of anticipation **must be reversed**. 43 USPQ2d at 1033. The claims must first have been correctly construed to define the scope and meaning of each contested limitation. See also Paulsen.³⁰⁸ The court in Paulsen commented that in order to properly compare a reference with the claims, it is necessary to construe the contested term to ascertain its scope and meaning. Id. at 1674. See also Sections 7.3.5.1, 7.2.6, and 7.6.4.

³⁰⁷ In re Miller, 441 F.2d 689, 169 USPQ 597 (CCPA 1971).

³⁰⁸ In re Paulsen, 30 F.2d 1475, 31 USPQ2d 1671, 1674 (Fed. Cir. 1994).

The court in Gechter further commented that, for anticipation, the PTO must expressly find that every limitation in the claim was identically shown in the single reference. 43 USPQ2d at 1035. Such findings should provide an explanation for whether, how, and why the reference contains each of the limitations of the claim. Thus, said the court, the explanation should define the exact function of the elements as well as find that the prior art reference disclosed the identical function.

Further, the Examiner is required to consider the scope and meaning of the limitations used in the claims; i.e., construe each contested claim limitation. However, the Examiner has not performed any of the analyses required by Gechter and Paulsen for determining the scope and meaning of the contested limitations. See also Sections 7.3.5.1, 7.2.6, and 7.6.4.

In direct violation of Gechter, other court precedent, and the PTO's rules; the Examiner disregards important claim limitations, has not properly supported the art rejections on a limitation-by-limitation basis with specific fact findings for each contested limitation and satisfactory explanations for such findings, has not explicitly explained the claim construction used in contesting the limitations, and has not supported the art rejections with adequately explained fact findings for each relevant factor. This is not surprising since such analyses would have confirmed that the claims distinguish over the references and the Examiner would not have been able to persist in the art rejections.

The different limitations and different combinations recited in the claims are discussed in Section 5.1. The different interconnection and interrelation limitations recited in the claims are discussed in Section 5.2. These different limitations and different combinations render each of the claims (independent claims and claims depending therefrom) separately patentable. These limitations are not properly addressed in the § 102 rejections. Hence, for this additional reason, the § 102 rejections fail to establish a prima facie case.

In view of the above, the Examiner has not provided a Gechter analysis in support of the art rejections because a Gechter analysis would show that the claims do indeed distinguish over the references. Since the instant claims distinguish over the references, the art rejections should be reversed.

7.6.3 The Art Rejections Overlook The Significant Differences Between The Instant Claims And The References

There are significant differences between the instant claims and the references which have been overlooked by the Examiner. See, e.g., Section 5. These include the novel combinations of elements, acts, or functions (Table 5.1 and Table 5.3) and the novel combinations of interconnections (Table 5.2). The Examiner has not properly reconciled these significant differences, much less properly read each contested instant claim on each applied reference, nor properly read each contested limitation on the applied references, nor properly provided the required Gechter, Graham, and Rouffet analyses.

The novel combinations of elements and acts for the independent claims are set forth in Section 5.1. In addition to the element, act, or function claim limitations, the contested claim limitations include “‘ing” verb’ (e.g., generating, storing, etc.)³⁰⁹ limitations, responsiveness³¹⁰ limitations, coupling limitations, and combinations thereof. However, the rejections disregard these “‘ing” verb’ limitations, responsiveness limitations, and coupling limitations.

In view of the above, the instant claims have significant differences that are not anticipated nor rendered obvious by the references. Hence, the art rejections should be reversed.

7.6.4 The Examiner’s Attempt To Construe The Claims Regarding The Art Rejections Is Erroneous

The Examiner attempted to construe the claims (instant Action at 30-36), but this claim construction is fatally defective (Sections 7.3.5.1, 7.2.6, and 7.6.4). For example, the Examiner failed to construe each rejected claim as a whole and the Examiner disregarded many contested claim limitations; e.g.; the “in response to” claim limitations; (Sections 7.7.4 and 7.8.9). This despite the fact that claim construction is “an essential part of the examination process” (Section 7.2.6).

³⁰⁹ The Federal Circuit uses the term “‘ing” verb’ (passing, heating, reacting, transferring, etc.) in its discussion in Q.I. Corp. v. Tekmar, 115 F.3d 1576, 1583, 42 USPQ2d 1777, 1782 (Fed. Cir. 1997).

³¹⁰ E.g., “in response to ...”.

Further, the Examiner did not properly consider either the “intrinsic” evidence (e.g., the disclosure) or the extrinsic evidence (e.g., the prior art), as required. See Phillips (Section 7.2.6). Instead, the Examiner appears to have made up much of the claim construction in a vacuum. The Examiner’s attempted claim construction appears to be in large part the Examiner’s own conclusory statements, which is improper.

Further, the Examiner’s attempted claim construction includes significant unclaimed subject matter, which is improper (Section 7.3.5.1). The Examiner should have focused his claim construction on the claimed invention. However, the Examiner instead buried relevant information that he may have within “boilerplate” that constitutes unclaimed subject matter.

Further, the Examiner’s attempted claim construction disregards the claims as a whole and instead addresses functions or elements alone in a vacuum. It completely ignores the claimed interconnections and interrelations that the Examiner finds to be so important to the '112-1 rejections.

Hence, because the Examiner has failed to properly construe the claims, the art rejections fail to establish a *prima facie* case and should be reversed.

7.6.5 The Examiner Failed To Give Weight To Important Claim Limitations And Hence Failed To Establish A Prima Facie Case Of Obviousness

The Examiner failed to give weight to many of the claim limitations (Sections 7.7.4 and 7.8.9). However, this is clear error.³¹¹

Because the “product” limitations appear in the bodies of the claims rather than in their preambles, we do not agree that they can be treated as “field of use” limitations and thus given no weight. Cf. In re Paulsen, 30 F.3d 1475, 1479, 31 USPQ2d 1671, 1673 (Fed. Cir. 1994).... Consequently, it is necessary to determine whether the examiner has adequately explained why these “product” recitations, when given weight, render the claims indefinite.

³¹¹ Ex Parte Hyatt, Appeal No. 2003-0794 in Serial No. 08/471,799 at pp. 24-25 (July 6, 2005) (unpublished opinion). See Appendix 10 attached hereto (the Related Proceedings Appendix).

In particular, the Examiner herein disregarded many claim limitations in the art rejections. For example, many of the claims have extensive recitations of limitations including not only the functions but also the interconnections and responsiveness therebetween. However, the Examiner selectively attempted to read bits-and-pieces of the claims on the references, giving many claim limitations no weight at all, disregarding interconnections and responsiveness, and attempting to read other claim limitations on arbitrary and diverse parts of the references that do not meet the claim limitations.

For example, see the discussions in Sections 7.7.4 and 7.8.9. Hence, the art rejections of these claims should be reversed for failing to establish a prima facie case.

Further, for similar reasons, giving no weight to important claim limitations and attempting to read claim limitations on diverse parts of the references, the art rejections of all the rest of the claims should be reversed for failing to establish a prima facie case.

7.6.6 The Examiner's Discussions Of Fant, Sacks, Rogoff, and Meagher Constitute Improper Conclusory Statements

The Examiner's discussions of Fant, Sacks, Rogoff, and Meagher (instant Action at 77-143, 59-67, 43-58, 39-42, respectively) are improper. These discussions are the Examiner's attempt to interpret the references. However, these discussions do not specifically address the claim limitations and therefore are irrelevant. These discussions are the Examiner's own conclusory statements, which is improper (e.g.; Section 7.2.3). Further, the Examiner's discussions of Fant, Sacks, Rogoff, and Meagher constitute significant unclaimed subject matter, which is improper (Section 7.3.5.1). The Examiner should have focused his discussion on the claimed invention. Relevant information should not have been buried within the extensive "boilerplate."

Further, the Examiner's discussions of Fant, Sacks, Rogoff, and Meagher ignore the claims as a whole and instead address functions or elements alone in a vacuum. These discussions completely ignore the claimed interconnections and interrelations that the Examiner finds to be so important to the '112-1 rejections.

Further, the Examiner's discussions of Fant, Sacks, Rogoff, and Meagher use terminology that is different than the terminology of the claims, yet the Examiner does not adequately reconcile the differences in terminology.

Fant is composed of many bits and pieces, but Fant does not teach the claimed invention as a whole. For example, Fant shows drawings of intended pictorial results (e.g.: Figs 1, 2A, 2B, 4-12, 14-20, 22, 23, 30, and 42-43B), but does adequately teach how to create these pictorial results with his simulation system. Further, Fant provides some mathematical equations, some geometric diagrams, and some tables (e.g., Figs. 21, 28-29, 44-45, and 46-49), but does adequately teach how to create the pictorial results with these equations and geometric diagrams. Further, Fant provides some block diagrams (e.g.; Figs. 3, 13, 31-36, 40, and 50-52), but does adequately teach how to create the pictorial results with these block diagrams. Further, Fant provides some symbol diagrams (e.g.; Figs. 24-27, and 41), and address diagrams (e.g.; Figs. 37-39) but does adequately teach how to create the pictorial results with these diagrams.

7.6.7 The Art Rejections Do Not Establish A Prima Facie Case

The art rejections do not establish a prima facie case³¹², as discussed below.

The failure of the Examiner to establish a prima facie case is, by itself, dispositive of the art rejections. Judge Hairston in Hyatt-'852³¹³ stated:

Without a showing that each and every limitation of the claimed invention is found in the Schutt reference, either explicitly or inherently, the anticipation rejection is reversed....

For all of the reasons set forth in the immediately preceding paragraph, the obviousness rejection based upon the combined teachings of Schutt and Sundet is reversed for lack of a prima facie case of obviousness. Without an initial prima facie case, the burden never

³¹² See 37 CFR 1.106(b); Chester v. Miller, 906 F.2d 1574, 1578, 15 USPQ2d 1333, 1337 (Fed. Cir. 1990) ("Section 132 is violated when a rejection is so uninformative that it prevents the applicant from recognizing and seeking to counter the grounds for rejection."). See also In re Oetiker, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992).

³¹³ Ex parte Hyatt, Appeal No. 2001-2172, Paper No. 31 at 8-9 in patent application Serial No. 08/436,852 (PTO Bd. App. July 25, 2002) [herein Hyatt-'852] (unpublished PTO decision) (footnote removed).

shifted to appellant to provide a rebuttal. In re Oetiker 977 F.2d 1443, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992)....

As indicated supra, the mere listing of elements does not satisfy the examiner's burden of presenting a prima facie case of obviousness of the claims as a whole.

Similarly, the Examiner herein has failed to establish a prima facie case, which is dispositive of the art rejections.

Further, the Examiner has failed to establish a prima facie case for the following reasons.

- a. The art rejections do not properly consider the claimed invention as a whole (MPEP 2141).
- b. The art rejections do not properly consider the references as a whole (MPEP 2141).
- c. The art rejections do not properly determine the scope and content of the prior art (MPEP 2141).
- d. The art rejections disregard relevant claim limitations.
- e. The Federal Circuit requires a limitation-by-limitation analysis, but the art rejections do not properly provide a claim-by-claim analysis (Section 7.6.2) much less a proper limitation-by-limitation analysis.
- f. The Appellant properly traversed the Examiner's unsupported statements, but the Examiner did not provide the required reference or affidavit in accordance with MPEP 2144.03.

Judge Fleming in Hyatt-'041³¹⁴ stated:

OPINION

We will not sustain the rejection of claims 1 through 76 under U.S.C. 103.

The Examiner has failed to set forth a prima facie case. It is the burden of the Examiner to establish why one having ordinary skill in the art would have been led to the claimed invention by the reasonable teachings or suggestions found in the prior art, or by a reasonable

³¹⁴ Ex parte Hyatt, Appeal No. 94-4132, Paper No. 28 at 4 in patent application Serial No. 07/578,041 which issued as U.S. Patent No. 5,526,506 on June 11, 1996 (Bd. Pat. App. & Int. October 31, 1995) [herein Hyatt-'041] (unpublished PTO decision).

inference to the artisan contained in such teachings or suggestions. In re Sernaker, 702 F.2d 989, 217 USPQ 1 (Fed. Cir. 1983).

The burden of establishing a prima facie case is not satisfied by a mere matching up of elements in a reference with those in a claim. See Hyatt-'041 (overturning a rejection which matched up a claimed detector with a prior art decoder). See also Edwards and Oetiker.³¹⁵

Judge Krass in Hyatt-'243³¹⁶, in reversing all of the rejections under 35 USC § 102 and 35 USC § 103, stated:

The examiner's approach appears to suggest that the generation of one certain frequency means that there is suppression of other frequencies and that somehow this equates to filter processing. **In our view, the examiner's interpretation is a stretch which goes beyond all bounds of reasonableness.**

In view of the above, the art rejections do not establish a prima facie case. Hence, the art rejections should be reversed.³¹⁷

7.6.8 The Examiner's Inherency Contentions Are Erroneous

The Examiner relies on erroneous inherency contentions. However, these inherency issues violate the Federal Circuit requirements. See Rijckaert.³¹⁸ Also, a self-serving allegation of inherency is no substitute for the "substantial evidence" requirement of the U.S. Supreme Court and the Federal Circuit (Section 7.2.2). Hence, the § 103 rejections must fall.

The Examiner, unable to find certain claim limitations in the reference, erroneously alleges inherency. However, the Examiner does not support this inherency position. The Examiner never performed the required Gechter analysis or Graham analysis and never provided the required showing of the basis in fact and technical reasoning. Nor did he provide the necessary objective evidence or

³¹⁵ In re Edwards, 568 F.2d 1349, 1354, 196 USPQ 465, 469 (CCPA 1978); In re Oetiker, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992).

³¹⁶ Ex parte Hyatt, Appeal No. 92-1284, Paper No. 66 at 4-5 in patent application Serial No. 06/849,243 which issued as U.S. Patent No. 5,410,621 on April 25, 1995 (Bd. Pat. App. & Int. May 17, 1994) [herein Hyatt-'243] (unpublished PTO decision) (emphasis added).

³¹⁷ In re Oetiker, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992).

³¹⁸ In re Rijckaert, 9 F.3d 1531, 28 USPQ 1955 (Fed. Cir. 1993).

cogent technical reasoning to support the holding of inherency. See MPEP 2112. Hence, the Examiner fails to establish a prima facie case of inherency sufficient to support the rejections.

MPEP 2112 sets forth the requirements for reliance on inherency to support a rejection. However, the Examiner has not even addressed and has certainly not met these requirements.

In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art.

Levy.³¹⁹

“[A]ssertions of technical facts in areas of esoteric technology must always be supported by citation of some reference work” and “allegations concerning specific ‘knowledge’ of the prior art, which might be peculiar to a particular art should also be supported.”

MPEP 2144.03.³²⁰ However, the Examiner has not provided any basis in fact or technical reasoning to support the inherency allegation and the allegedly inherent characteristic does not necessarily flow from the teachings of the applied prior art. Hence, for these additional reasons, the inherency allegations are fatally defective.

Notwithstanding the above discussed failure to establish inherency, the Examiner has not addressed other requirements regarding inherency.

[T]he inherency of an advantage and its obviousness are entirely different questions. That which may be inherent is not necessarily known. Obviousness cannot be predicated on what is unknown.

Spormann.³²¹

The mere fact that a certain thing may result from a given set of circumstances is not sufficient to establish inherency.... That which may be inherent is not necessarily known.... Such a retrospective view of inherency is not a substitute for some teaching or suggestion supporting an obviousness rejection.

³¹⁹ Ex parte Levy, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (emphasis in original). See also MPEP 2112.

³²⁰ MPEP 2144.03 (quoting In re Ahlert, 424 F.2d 1088, 1091, 165 USPQ 418, 420-21 (CCPA 1970)) (all quotation marks in original).

³²¹ In re Spormann, 363 F.2d 444, 448, 150 USPQ 449, 452 (CCPA 1966) (citing In re Adams, 53 CCPA 996, 356 F.2d 998, 148 USPQ 742 (1966)).

See Rijckaert.³²² However, the Examiner has never attempted to establish that the allegedly inherent limitation was “necessarily known”.

In view of the above, the subject limitations in the instant claims are not inherent in the references. Hence, the § 103 rejections based thereon should be reversed.

³²² In re Rijckaert, 9 F.3d 1531, 28 USPQ 1955, 1957 (Fed. Cir. 1993).

7.7 THE 35 USC § 102 ANTICIPATION REJECTIONS

7.7.1 The Law Regarding § 102 Rejections

The references relied on for the § 102 rejections do not provide the identity necessary to support the § 102 rejections.

The 35 USC § 102 rejection does not establish a prima facie case. For example, the rejection violates the Federal Circuit **requirements** that a § 102 rejection must be supported on a limitation by limitation basis with specific fact findings for each contested limitation and satisfactory explanations for such findings and that claim construction for the contested claim limitations must be explicit. Gechter v. Davidson, 43 USPQ2d 1031 at 1035. Further, the § 102 rejection violates the requirement that every limitation of a claim must identically appear in a single prior art reference for it to anticipate the claim. In re Bond, 910 F.2d 831, 832, 15 USPQ2d 1566, 1567 (Fed. Cir. 1990) as cited in Gechter v. Davidson, 43 USPQ2d 1031 at 1032. The law requires **identity** between the rejected claims and the references for a § 102 rejection; as discussed below. However, the § 102 rejections do not establish this identity. This is not surprising, there is no such identity. The claims have features that distinguish over the references.

Rejections for anticipation or lack of novelty requires, as the first step in the inquiry, that all the elements of the claimed invention be described in a single reference. Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989), cert. denied, 110 S.Ct. 154 (1989). Further, the reference must describe the applicant's claimed invention sufficiently to have placed a person of ordinary skill in the field of the invention in possession of it. In re Spada, 911 F.2d 705, 15 USPQ2d 1655 (Fed. Cir. 1990).

An anticipation analysis must be conducted on a limitation by limitation basis, with specific fact findings for each contested limitation and satisfactory explanations for such findings. Claim construction for contested claim limitations must also be explicit. Anticipation requires that every limitation in the claim was identically shown in a single reference. Gechter v. Davidson, 116 F.3d 1454, 43 USPQ2d 1031 at 1035 (Fed. Cir. 1997). See also Sections 7.3.5.1, 7.2.6, and 7.6.4.

The rejection relies on bits and pieces found in the prior art. However, the finding of bits and pieces of the claimed invention does not establish anticipation.³²³

Only god works from nothing. Man must work with old elements.
Just because the elements existed does not mean that they are combined in the claimed manner or that they cooperate in the claimed manner.

Other case law further illustrates the deficiencies in the § 102 rejections.

Anticipation under 35 U.S.C. paragraph 102 can be found only when reference discloses exactly what is claimed.

Titanium Metals Corp. of America v. Banner, 778 F.2d 775., 780, 227 USPQ 773, 777 (Fed. Cir. 1985).⁷ The prior art relied on by plaintiff does not constitute an anticipation of claims 18, 19 and 20 of the Wollard patent under 35 U.S.C. paragraph 102. Anticipation can exist only where a single prior art reference teaches the same elements as claimed, united in the same way to perform an identical function. Illinois Tool Works, Inc. v. Sweetheart Plastics, Inc., 436 F.2d 1180, 168 USPQ 451 (7th Cir. 1971); McCullough Tool Co. v. Wells Survey, Inc., 343 F.2d 381, 398, 145 USPQ 6, 19-20 (10th Cir. 1965); cert. denied 383 U.S. 933, 148 USPQ 772 (1966).

Penn Yan Boats, Inc. v. Sea Lark Boats, Inc., 175 USPQ 260, 273 (S.D.Fla 1972).

The Federal Circuit has established that the party asserting anticipation (in the present case, the patent examiner) must demonstrate the identity between the claimed invention and the reference by showing that each element of the claim was either expressly or inherently described in a single prior art reference or that the claimed invention was known previously or encompassed in a single prior art device or practice. See Kalman v. Kimberly-Clark Corp., 713 F.2d 771, 218 USPQ 789 (Fed.Cir. 1983). The Federal Circuit confirmed this standard of anticipation in In re Donohue, 766 F.2d 531, 533, 226 USPQ 619, 621 (Fed.Cir. 1985) and Ralston Purina Co. v. Far-Mar-Co, Inc., 772 F.2d 1570, 1574, 227 USPQ 177, 180 (Fed.Cir. 1985).

A § 102 rejection should demonstrate identity of invention. See Kalman.³²⁴ See also SRI.³²⁵ Identity of invention is a question of fact – one who seeks such a finding must show that each element

³²³ See 65 J.Pat.Off.Soc'y 331; Howard T. Markey; Chief Judge; Court of Appeals for the Federal Circuit.

³²⁴ Kalman v. Kimberly-Clark Corp., 713 F.2d 760, 771, 218 USPQ 781, 789 (Fed. Cir. 1983), cert. denied, 465 U.S. 1026, 224 USPQ 520 (1984), overruled in part on another ground.

of the claim in issue is found, either expressly or under principles of inherency, in a single prior art reference, or that the claimed invention was previously known or embodied in a single prior art device or practice. See Minnesota.³²⁶ The reference must describe the claimed invention sufficiently to have placed a person of ordinary skill in the field of the invention in possession of it. See Spada.³²⁷

The Federal Circuit further requires for a finding of anticipation that the same arrangement be literally present in the claim as it is in the reference and be shown in as complete detail as in the claim.

The district court correctly instructed the jury that an invention is anticipated if the same device, including all the claim limitations, is shown in a single prior art reference. Every element of the claimed invention must be literally present, **arranged as in the claim**. Perkin-Elmer Corp., 732 F.2d at 894, 221 USPQ at 673; Kalman v. Kimberly-Clark Corp., 713 F.2d 760, 771-72, 218 USPQ 781, 789 (Fed. Cir. 1983), cert. denied, 465 U.S. 1026 [224 USPQ 520] (1984). The identical invention must be shown **in as complete detail as is contained in the patent claim**. Jamesbury Corp., 756 F.2d at 1560, 225 USPQ at 256; Connell, 722 F.2d at 1548, 220 USPQ at 198.

Richardson³²⁸. Hence, the required identity must also consider the recited coupling and the recited responsiveness in the claims.

Judge Smith in Hyatt-'430³²⁹, in reversing the rejection under § 102, stated:

There can be many different structures which carry out identical functions, and these different structures do not automatically anticipate each other within the meaning of 35 U.S.C. 102.

³²⁵ SRI Int'l v. Matsushita Elec. Corp. of Am., 775 F.2d 1107, 1125, 227 USPQ 577, 588-89 (Fed. Cir. 1985) (in banc).

³²⁶ Minnesota Mining and Manufacturing v. Johnson & Johnson, 976 F.2d 1559, 24 USPQ2d 1321 (Fed. Cir. 1992).

³²⁷ In re Spada, 911 F.2d 705, 15 USPQ2d 1655 (Fed. Cir. 1990).

³²⁸ Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989), cert. denied, 110 S.Ct. 154 (1989) (emphasis added).

³²⁹ Ex parte Hyatt, Appeal No. 95-2551, Paper No. 27 at 8-9 in patent application Serial No. 07/468,430 which issued as U.S. Patent No. 5,594,908 on January 14, 1997 (Bd. Pat. App. & Int. May 22, 1996) [herein Hyatt-'430] (unpublished PTO decision).

7.7.2 The § 102 Rejections Are Fatally Defective

The 35 USC § 102 rejections are based upon conclusory statements that supposedly establish anticipation. However, there are significant differences between the claims and the references. Yet the Examiner has not properly reconciled these differences. Thus, the claims prima facie distinguish the references. Consequently, the required identity has not been established. For this reason alone, the § 102 rejections must fall.

There are many novel differences between the instant claims and the references. Nevertheless, even though the arguments herein establish significant novel claim differences, the Examiner has not properly reconciled these differences, much less properly read each contested instant claim on each applied reference, nor properly read the contested claim limitations on the applied references, nor provided the required Gechter³³⁰ analysis.

Further, the novel combination of limitations for each independent claim are set forth in Section 5.1. These novel combinations of limitations illustrate the significant distinctions between the instant claims and the references.

Further, each apparatus claim and each process claim recites novel combinations of responsive³³¹ limitations in addition to the novel combination of elements and novel combination of “ing” verb’ limitations.

Further, each apparatus claim has a novel combination of coupling limitations in addition to the novel combination of elements, novel combination of “ing” verb’ limitations, and novel combination of responsive limitations.

The recited elements, “ing” verb’ limitations, responsiveness limitations, coupling limitations, and combinations thereof all constitute contested limitations.

Further, the Examiner has ignored the interconnections recited in the claims. Thus, the required identity has not been established. For this reason alone, the 35 USC § 102 rejections must fall.

³³⁰ Gechter v. Davidson, 116 F.3d 1454, 43 USPQ2d 1030 (Fed. Cir. 1997).

³³¹ E.g., “in response to ...”.

Further, the Examiner has not shown how or where all specific elements of the reference corresponds to all specific elements of the claims, much less that they are identical. See Section 7.7.4 regarding a traverse of the Examiner's assertions regarding the § 102 rejections.

In view of the above, the Examiner has not established anticipation -- in fact, he has established non-anticipation.

7.7.3 The § 102 Rejections Do Not Establish A Prima Facie Case

The 35 USC § 102 rejections do not establish a prima facie case for the reasons discussed in Section 7.6.7 and for the additional reasons outlined below.

The Examiner must support § 102 rejections with a proper explanation of why the claims are anticipated by the reference. Such support of the § 102 rejections requires, as stated above, an evaluation of the claims as a whole, the references as a whole, a proper construction of each of the rejected claims to determine their scope and meaning, a proper limitation-by-limitation analysis of each claim element, a proper claim-by-claim analysis of each of the claims subject to rejection and consideration of all of the words in each claim.

The prima facie case, for purposes of anticipation, requires that the anticipation analysis be conducted on a limitation-by-limitation basis with specific fact findings for each limitation and an explanation for the findings, as well as explicit claim construction. See Gechter.³³² It is well-established that identity of invention is required for anticipation. This means that every limitation in the claim must be identically shown in a single reference. Identity of invention also requires identity of function. Failure to meet these basic criteria, as in the instant case, constitutes a failure to establish a prima facie case of anticipation.

In view of the above, the § 102 rejections do not establish a prima facie case. Hence, the § 102 rejections should be reversed.³³³

³³² Gechter v. Davidson, 116 F.3d 1454, 43 USPQ2d 1030 (Fed. Cir. 1997).

³³³ In re Oetiker, 977 F.2d 1443, 24 U.S.P.Q.2d 1443 (Fed. Cir. 1992).

7.7.4 Traverse Of The Examiner's Statements Regarding The § 102 Rejections

7.7.4.1 The § 102 rejection over Netravali

The Examiner states (instant Action at 36-37):

8. Claims 187, 209, 235 and 279 are rejected under 35 U.S.C. 102(b) as being anticipated by Netravali et al (U.S. 4,245,248 A).

Netravali discloses generating multiplexed image information (input data from channel 60 is multiplexed image information, see figure 5); generating demultiplexed first channel image information by demultiplexing in response to the multiplexed image information (see figure 6, output 603 from demultiplexer 602 is the claimed "demultiplexed first channel image information"); and generating demultiplexed second channel image information by demultiplexing in response to the multiplexed image information (output 604 is the claimed "second channel image information").

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 187, 209, and 279; respectively:

187. A process comprising the acts of:
 storing prior pixel image information, the prior pixel image information representing a prior image;
 storing next pixel image information, the next pixel image information representing a next image;
 generating prior vector information in response to the prior pixel image information;
 generating next vector information in response to the next pixel image information; and
 generating 64-pixel blocks of temporally interpolated image information in response to the prior vector information, in response to the next vector information, in response to the prior pixel image information, and in response to the next pixel image information.

209. A process comprising the acts of:

storing prior pixel image information, the prior pixel image information representing a prior image;
 storing next pixel image information, the next pixel image information representing a next image;
 generating prior motion vector information in response to the prior pixel image information;
 generating next motion vector information in response to the next pixel image information; and
 generating 64-pixel blocks of temporally interpolated image information in response to the prior motion vector information, in response to the next motion vector information, in response to the prior pixel image information, and in response to the next pixel image information.

279. A process comprising the acts of:
 storing prior pixel image information representing a prior image;
 storing next pixel image information representing a next image;
 generating prior motion vector information in response to the prior pixel image information;
 generating next motion vector information in response to the next pixel image information;
 generating 64-pixel blocks of weighted image information in response to the prior pixel image information, in response to the next pixel image information, in response to the prior motion vector information, and in response to the next motion vector information; and
 generating transformed image information in response to the 64-pixel blocks of weighted image information, in response to the prior pixel image information, and in response to the next pixel image information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 37):

Netravali discloses the act of making a position product (the position product in Netravali is image data).

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1).

Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Netravali does not support the Examiner's statement. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 187, 209, and 279; respectively:

187. A process comprising the acts of:
 storing prior pixel image information, the prior pixel image information representing a prior image;
 storing next pixel image information, the next pixel image information representing a next image;
 generating prior vector information in response to the prior pixel image information;
 generating next vector information in response to the next pixel image information; and
 generating 64-pixel blocks of temporally interpolated image information in response to the prior vector information, in response to the next vector information, in response to the prior pixel image information, and in response to the next pixel image information.

209. A process comprising the acts of:
 storing prior pixel image information, the prior pixel image information representing a prior image;
 storing next pixel image information, the next pixel image information representing a next image;
 generating prior motion vector information in response to the prior pixel image information;
 generating next motion vector information in response to the next pixel image information; and
 generating 64-pixel blocks of temporally interpolated image information in response to the prior motion vector information, in response to the next motion vector information, in response to the prior pixel image information, and in response to the next pixel image information.

279. A process comprising the acts of:
 storing prior pixel image information representing a prior image;
 storing next pixel image information representing a next image;
 generating prior motion vector information in response to the prior pixel image information;

generating next motion vector information in response to the next pixel image information;
 generating 64-pixel blocks of weighted image information in response to the prior pixel image information, in response to the next pixel image information, in response to the prior motion vector information, and in response to the next motion vector information; and
 generating transformed image information in response to the 64-pixel blocks of weighted image information, in response to the prior pixel image information, and in response to the next pixel image information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 37):

Netravali discloses generating a frame of input image information (frame input, figure 2); generating a frame of data compressed image information in response to the frame of input image information (output of linear transform 101); generating a frame of data decompressed image information in response to the frame of data compressed image information (output of inverse transform 201); generating a frame of feedback image information in response to the frame of data decompressed image information (output of buffer 203); and generating the frame of data compressed image information in response to the frame of feedback image information (output of linear transform 204).

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 187, 209, and 279; respectively:

187. A process comprising the acts of:
 storing prior pixel image information, the prior pixel image information representing a prior image;

storing next pixel image information, the next pixel image information representing a next image;
 generating prior vector information in response to the prior pixel image information;
 generating next vector information in response to the next pixel image information; and
 generating 64-pixel blocks of temporally interpolated image information in response to the prior vector information, in response to the next vector information, in response to the prior pixel image information, and in response to the next pixel image information.

209. A process comprising the acts of:
 storing prior pixel image information, the prior pixel image information representing a prior image;
 storing next pixel image information, the next pixel image information representing a next image;
 generating prior motion vector information in response to the prior pixel image information;
 generating next motion vector information in response to the next pixel image information; and
 generating 64-pixel blocks of temporally interpolated image information in response to the prior motion vector information, in response to the next motion vector information, in response to the prior pixel image information, and in response to the next pixel image information.

279. A process comprising the acts of:
 storing prior pixel image information representing a prior image;
 storing next pixel image information representing a next image;
 generating prior motion vector information in response to the prior pixel image information;
 generating next motion vector information in response to the next pixel image information;
 generating 64-pixel blocks of weighted image information in response to the prior pixel image information, in response to the next pixel image information, in response to the prior motion vector information, and in response to the next motion vector information; and
 generating transformed image information in response to the 64-pixel blocks of weighted image information, in response to the prior pixel image information, and in response to the next pixel image information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 37):

Netravali discloses the act of making a product (a product in Netravali is image data).

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Netravali does not support the Examiner’s statement. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 187, 209, and 279; respectively:

187. A process comprising the acts of:
 storing prior pixel image information, the prior pixel image information representing a prior image;
 storing next pixel image information, the next pixel image information representing a next image;
 generating prior vector information in response to the prior pixel image information;
 generating next vector information in response to the next pixel image information; and
 generating 64-pixel blocks of temporally interpolated image information in response to the prior vector information, in response to the next vector information, in response to the prior pixel image information, and in response to the next pixel image information.

209. A process comprising the acts of:
 storing prior pixel image information, the prior pixel image information representing a prior image;
 storing next pixel image information, the next pixel image information representing a next image;

generating prior motion vector information in response to the prior pixel image information;

generating next motion vector information in response to the next pixel image information; and

generating 64-pixel blocks of temporally interpolated image information in response to the prior motion vector information, in response to the next motion vector information, in response to the prior pixel image information, and in response to the next pixel image information.

279. A process comprising the acts of:
 storing prior pixel image information representing a prior image;
 storing next pixel image information representing a next image;
 generating prior motion vector information in response to the prior pixel image information;
 generating next motion vector information in response to the next pixel image information;
 generating 64-pixel blocks of weighted image information in response to the prior pixel image information, in response to the next pixel image information, in response to the prior motion vector information, and in response to the next motion vector information; and
 generating transformed image information in response to the 64-pixel blocks of weighted image information, in response to the prior pixel image information, and in response to the next pixel image information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 37-38):

Netravali et al. disclose a process comprising the acts of: storing database memory management information (see column 6, lines 11-15: The reference describes that each of the memories 301 and 302 include address inputs for receiving address information (i.e. database memory management information).); storing frames of image information in a database memory (see column 6, lines 5-11: The reference describes that intensity information representing the versions of the picture which precede and follow the picture being estimated (i.e. frames of image information) are stored in random access memory (i.e. database

memory)); and generating output frames of image information by accessing in response to the frames of image information stored in the database memory in response to the associative database memory management information (see column 6, lines 22-26: The reference describes that several picture elements are output from the memories 301 and 302 based on the intensity information representing the versions of the picture which precede and follow the picture being estimated (i.e. frames of image information) and the address information (i.e. associative database memory management information)).

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Netravali at “column 6, lines 11-15” does not teach a “database memory” nor “database memory management information” related thereto. Further, Netravali at “column 6, lines 22-26” does not teach an “associative database memory” nor “associative database memory management information” related thereto. Further, Netravali does not teach that his “address information” is “associative database memory management information”. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 187, 209, and 279; respectively:

187. A process comprising the acts of:
 storing prior pixel image information, the prior pixel image information representing a prior image;
 storing next pixel image information, the next pixel image information representing a next image;
 generating prior vector information in response to the prior pixel image information;
 generating next vector information in response to the next pixel image information; and
 generating 64-pixel blocks of temporally interpolated image information in response to the prior vector information, in response to the next vector information, in response to the prior pixel image information, and in response to the next pixel image information.

209. A process comprising the acts of:

storing prior pixel image information, the prior pixel image information representing a prior image;
 storing next pixel image information, the next pixel image information representing a next image;
 generating prior motion vector information in response to the prior pixel image information;
 generating next motion vector information in response to the next pixel image information; and
 generating 64-pixel blocks of temporally interpolated image information in response to the prior motion vector information, in response to the next motion vector information, in response to the prior pixel image information, and in response to the next pixel image information.

279. A process comprising the acts of:
 storing prior pixel image information representing a prior image;
 storing next pixel image information representing a next image;
 generating prior motion vector information in response to the prior pixel image information;
 generating next motion vector information in response to the next pixel image information;
 generating 64-pixel blocks of weighted image information in response to the prior pixel image information, in response to the next pixel image information, in response to the prior motion vector information, and in response to the next motion vector information; and
 generating transformed image information in response to the 64-pixel blocks of weighted image information, in response to the prior pixel image information, and in response to the next pixel image information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

7.7.4.2 The § 102 rejection over Grumet

The Examiner states (instant Action at 38-39):

9. Claim 472 is rejected under 35 U.S.C. 102(e) as being anticipated by Grumet (US 4,601,053 A).
 Grumet discloses:

generating a first channel of output image information representing a first perspective of an image (figures 1a and 1b, left camera view; figure 4, numeral 108);

generating a second channel of output image information representing a second perspective of the image, wherein the second perspective of the image is from a different x-axis position of the first perspective of the image (figures 1a and 1b, right camera view; figure 4, numeral 110); and

generating multiplexed image information in response to the first channel of output image information and in response to the second channel of output image information (figure 4, numerals 112 and 114; or 128-134, or figure 5a, numeral 165).

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, “figure [3], numerals 112 and 114; or 128-134” appears to maintain the separation between the left and right cameras, rather than multiplexing them. Further, the “MUX” shown in “figure 5a, numeral 165” does not appear to multiplex the signals from the right and left cameras. Thus, Grumet does not meet the claim limitations. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 472:

472. A process comprising the acts of:
 generating a first channel of output image information representing a first perspective of an image;
 generating a second channel of output image information representing a second perspective of the image, wherein the second perspective of the image is from a different X-axis position than the X-axis position of the first perspective of the image; and
 generating multiplexed image information in response to the first channel of output image information and in response to the second channel of output image information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

7.7.4.3 The § 102 rejection over Meagher

The Examiner states (instant Action at 39-42):

10. Claims 117, 148, 151, 173, 217, 229 and 385 are rejected under 35 U.S.C. 102(e) as being anticipated by Meagher (US 4,694,404 A).

Meagher discloses a system (figure 15) for acquiring x-ray images and generating a tomographic reconstruction (figure 15, numeral 129), whereby the user can rotate, translate and zoom/scale the images for display and thus simulate moving through a 3D environment within the scanned object (figure 15, numeral 150).

Meagher also discloses the following claimed features:

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner has not specifically identified which part of Meagher is relied upon (Section 7.6.6). Hence, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 117, 151, and 217; respectively:

117. A process comprising the acts of:
storing computer instructions;
generating X-ray image information; and
generating temporally interpolated image information in response to the X-ray image information and in response to the computer instructions.

151. A process comprising the acts of:
storing computer instructions;
generating X-ray image information; and

generating pattern recognition information in response to the X-ray image information and in response to the computer instructions.

217. A process comprising the acts of:
 storing computer instructions;
 generating X-ray image information; and
 generating graphic overlaid image information in response to the X-ray image information and in response to the computer instructions.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the "in response to" claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

7.7.4.4 The § 102 rejection over Rogoff

The Examiner states (instant Action at 42-58):

11. Claims 231, 388 and 527 are rejected under 35 U.S.C. 102(e) as being anticipated by Rogoff et al. (US 4,590,569 A).

Rogoff discloses:

An "on-board navigational system ... which continuously display in a plan view the present position of a navigating vehicle in relation to its surrounding environment, such as a ship making a passage within a channel or harbor or the like" at column 1, line 10.

In summary, as depicted in figure 4, Rogoff displays a color, composite depiction of a navigational chart superimposed with a radar image, and with moving graphic of the vessel itself, as well as moving graphics of other vessels and stationary objects detected using radar and depicting their current positions and headings. The charts are read out of chart files and pieced together to display the area of interest to the user. The vessel graphics leave a trail based on the vessel's heading and speed, where the vessel rotates or translates with changes in its position. Also displayed to the user are position and steering information.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1).

Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner has not specifically identified which part of Rogoff is relied upon (Section 7.6.6). Hence, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 231, 388 and 527; respectively:

231. A process comprising the acts of:
storing computer instructions;
generating navigation information; and
generating graphic overlaid image information in response to the
navigation information and in response to the computer instructions.

388. A process comprising the acts of:
storing computer instructions;
generating navigation information in response to the computer
instructions;
generating camera information with a camera; and
generating rotated image information in response to the
computer instructions and in response to the camera information.

527. A process comprising the acts of:
storing computer instructions;
generating navigation information; and
generating translated rotated image information in response to
the navigation information and in response to the computer instructions.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

7.7.4.5 The § 102 rejection over Sacks

The Examiner states (instant Action at 59):

12. Claims 137, 153, 249 and 579 are rejected under 35 U.S.C. 102(e) as being anticipated by Sacks et al. (US 4,736,437 A).
Sacks discloses:
storing first image information (figure 1, numeral 16);
storing video camera image information (figure 1, numeral 20);
generating rotation information (figure 1, numeral 18); and
generating comparison information in response to the images
and the rotation information (figure 1, numeral 24).

In general, Sacks discloses a pattern recognition/image comparison system, comprising:
generating input image information (figure 1, numeral 14);
storing reference image information (figure 1, numeral 16);
generating comparison information in response to the input and reference image information (figure 1, numeral 22).

Specifically, Sacks discloses a system (figure 1) comprising:

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner has not specifically identified which part of Sacks is relied upon (Section 7.6.6). Hence, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 137, 153, and 249; respectively:

137. A process comprising the acts of:
storing computer instructions;
generating camera image information; and
generating pattern recognition information in response to the camera image information and in response to the computer instructions.

153. A process comprising the acts of:
storing computer instructions;
generating television image information; and
generating pattern recognition information in response to the television image information and in response to the computer instructions.

249. A process comprising the acts of:
storing computer instructions;
generating television image information; and
generating warped image information in response to the television image information and in response to the computer instructions.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the "in response to" claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

7.7.4.6 The § 102 rejection over Taylor

The Examiner states (instant Action at 67):

13. Claim 105 is rejected under 35 U.S.C. 102(e) as being anticipated by Taylor et al. (US 4,563,703 A).

Taylor discloses:

storing image information on a disk drive (figure 6, numeral 23);
spatially interpolating the images (figures 7 and 8); and
temporally interpolating the images (figures 7 and 9).

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 105:

105. A process comprising the acts of:
storing computer instructions;
generating camera image information; and
generating temporally interpolated image information in
response to the camera image information and in response to the
computer instructions.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the "in response to" claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 67):

Taylor also discloses a system for provide "special effects" (column 1, line 7) to "reconstitute a picture of different shape or size to that input to the store" (column 1, line 13), which is "capable of producing greater flexibility in picture manipulation whilst maintaining

picture quality so that the resultant picture is not noticeably degraded" at column 1, Line 20. Taylor's system comprises weighting (figure 3, numeral 20; -"K" weights incoming pixels) and scaling (figure 3, numeral 38; the output of summer 38 includes a reduced size image, such as that depicted in figure 2c; e.g., "2:1 reduction in picture size" at column 3, line 26) using integral and fractional addresses (figure 3, numeral 12). Taylor's system is also capable of range variable processing (figure 5; "variable compression" at column 3, line 43).

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Taylor does not expressly teach such "weighting" at "figure 3, numeral 20; "K" weights incoming pixels" nor "scaling" at "figure 3, numeral 38; the output of summer 38 includes a reduced size image, such as that depicted in figure 2c; e.g., "2:1 reduction in picture size" at column 3, line 26".

Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 105:

105. A process comprising the acts of:
 storing computer instructions;
 generating camera image information; and
 generating temporally interpolated image information in
 response to the camera image information and in response to the
 computer instructions.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the "in response to" claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 67-68):

An input circuit generating input image information is provided by Taylor by explicit reference to "input" video in at least Figs. 1 and 3-4. A computer memory storing computer instructions is at least inherently provided by explicit reference to a "computer" as shown in at

least Fig. 6, block 20, and as noted in c. 5, lines 1-60, since computers must operate based on instructions. A processor generating spatially interpolated image information by spatially interpolating in response to the input image information and in response to the computer instructions is provided by Taylor with reference to the output of the computer 20 in Fig. 6 to the interpolation block 12 in Fig. 6 and c. 5, lines 1-52 and c. 6, lines 1-40, the interpolation process of Taylor being a "processor". An output memory and a memory writing circuit writing output image information into the output memory in response to the spatially interpolated image information, the output memory storing the output image information is provided by writing interpolated information within memory based on addressing is taught by Taylor in at least the abstract, c. 4, lines 61-63, c. 5, lines 26-52, and see also c. 2, lines 8-27, the last full paragraph in c. 2, and the paragraph bridging cols. 3-4, and the output memory 11 in at least Figs. 1 and 3.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Taylor at "Fig. 6, block 20, and as noted in c. 5, lines 1-60" does not teach a "[a] computer memory storing computer instructions". Further, the Examiner has not established the inherency thereof (Section 7.6.8). Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 105:

105. A process comprising the acts of:
 storing computer instructions;
 generating camera image information; and
 generating temporally interpolated image information in
 response to the camera image information and in response to the
 computer instructions.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the "in response to" claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 68):

The image information of Taylor corresponds to 8 x 8 pixels (i.e. 64 samples) and as also shown in Fig. 7.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 105:

105. A process comprising the acts of:
storing computer instructions;
generating camera image information; and
generating temporally interpolated image information in
response to the camera image information and in response to the
computer instructions.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 68):

Taylor provides for temporal interpolation also, and a television camera is provided at the input of the system of Taylor as the input video in at least Figs. 1 and 3 for example, and television is explicitly provided in at least the first full paragraph in c. 1 of Taylor, so that television information is generated throughout the system of Taylor.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Taylor at “Figs. 1 and 3 ... [or in] the first full paragraph in c. 1” does not mention “a television camera”. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 105:

105. A process comprising the acts of:
 storing computer instructions;
 generating camera image information; and
 generating temporally interpolated image information in
 response to the camera image information and in response to the
 computer instructions.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 68):

Taylor provides for temporal interpolation also, and where the
 image information of Taylor corresponds to 8 x 8 pixels (i.e. 64
 samples) also shown in Fig. 7.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 105:

105. A process comprising the acts of:
 storing computer instructions;
 generating camera image information; and
 generating temporally interpolated image information in
 response to the camera image information and in response to the
 computer instructions.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 68):

Taylor operates on video frames, e.g. the framestore block 11 in at least Figs. 1 and 3, and the plurality of frame image information shown in at least Fig. 7.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 105:

105. A process comprising the acts of:
storing computer instructions;
generating camera image information; and
generating temporally interpolated image information in response to the camera image information and in response to the computer instructions.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 69):

A plurality of blocks of 64 samples is also provided by Taylor as noted above, and as shown in Figs 2(a) - 2(d) showing a plurality of cells which are related to the blocks of 64 samples of Taylor.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1).

Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 105:

105. A process comprising the acts of:
storing computer instructions;
generating camera image information; and
generating temporally interpolated image information in
response to the camera image information and in response to the
computer instructions.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 69):

Taylor discloses displaying an image in response to the 64-pixel block of image information is provided by Taylor in at least the first full paragraph in c. 1 and c. 6, lines 40-56, where the displaying is provided by television broadcast to televisions.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Taylor does not expressly disclose “displaying”. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 105:

105. A process comprising the acts of:
storing computer instructions;
generating camera image information; and

generating temporally interpolated image information in response to the camera image information and in response to the computer instructions.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 69):

Occulting information is also provided by Taylor in at least c. 4, lines 50-60, where obscuring data information provides for occulting information if desired in the system of Taylor, and the addressing of Taylor is for addressing 64-pixel blocks where cited above.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 105:

105. A process comprising the acts of:
storing computer instructions;
generating camera image information; and
generating temporally interpolated image information in response to the camera image information and in response to the computer instructions.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

7.7.4.7 The § 102 rejection over Tescher

The Examiner states (instant Action at 69-70):

14. Claims 115, 127 and 380 as well as the remaining pending claims are rejected under 35 U.S.C. § 102(e) as being anticipated by Tescher et al., 4,541,012.

Tescher discloses storing pixel image information in a memory is provided by Tescher by at least memory block 13 in Fig. 1 or also by reference memory 14 in Fig. 1.

Generating transformed image information in response to the image information stored in the memory and in response to feedback information is provided by Tescher by transformation block 20 in Fig. 1, which takes input from at least memories 13 and 14 in Fig. 1, and further takes feedback from coder 22 via distortion calculator 18 and block 16 in Fig. 1. This feedback informs the transformer block 20 to perform transformation as noted in the first full paragraph in c. 6, so that it is clear that the transformer provides for transformation based on feedback.

Generating the feedback information in response to the transformed image information is provided by the transformed image later being quantized in block 23 and coded in block 22 in Fig. 1 and then fed back to block 18 to control the transformation process.

The claim is also anticipated with respect to feedback by at least feedback to the transformer from memory 21 in Fig. 1.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 115, 127 and 380; respectively:

115. A process comprising the acts of:
 storing prior pixel image information, the prior pixel image information representing a prior image;
 storing next pixel image information, the next pixel image information representing a next image; and
 generating 64-pixel blocks of spatially interpolated image information in response to the prior pixel image information and in response to the next pixel image information.

127. A process comprising the acts of:
 storing prior pixel image information representing a prior image;

storing next pixel image information representing a next image;
 and
 generating transformed image information in response to the
 prior pixel image information and in response to the next pixel image
 information.

380. A system comprising:
 memory means for storing pixel image information;
 means for generating weight information;
 means for generating scale factor information; and
 means for generating scaled weighted image information in
 response to the pixel image information stored in the memory means, in
 response to the scale factor information, and in response to the weight
 information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 70):

For claim 127, storing prior pixel image information
 representing a prior image is provided by Tescher by image memory
 block 13 in Fig. 1 and as noted in the paragraph bridging cols. 5-6,
 which stores a previous image.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 127:

127. A process comprising the acts of:
 storing prior pixel image information representing a prior image;
 storing next pixel image information representing a next image;
 and

generating transformed image information in response to the prior pixel image information and in response to the next pixel image information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 70):

Storing next pixel image information representing a next image is also stored in the same memory block 13 in Fig. 1 as noted in the paragraph bridging cols. 5-6. Furthermore/alternatively, next pixel images are also provided by memory 14 in Fig. 1 and as noted in the first full paragraph in c. 6, where Tescher explicitly teaches updating the memory with new image information in the form of 64-pixel blocks.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 127:

127. A process comprising the acts of:
 storing prior pixel image information representing a prior image;
 storing next pixel image information representing a next image;
 and
 generating transformed image information in response to the prior pixel image information and in response to the next pixel image information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 70):

Generating transformed image information in response to the prior pixel image information and in response to the next pixel image information is provided by the transformation block 20 in Fig. 1, which takes input from both memories 13 and 14, as clearly shown in Fig. 1.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 127:

127. A process comprising the acts of:
 storing prior pixel image information representing a prior image;
 storing next pixel image information representing a next image;
 and
 generating transformed image information in response to the
 prior pixel image information and in response to the next pixel image
 information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 70):

For claim 115, storing prior and next pixel image information, the prior and next pixel image information representing a prior and next image is provided by the sequence of video images of Tescher in Fig. 2, blocks 21' and 13', which both provide for storing images of the video sequence as indicated in c. 10, lines 30-50.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 115:

115. A process comprising the acts of:
 storing prior pixel image information, the prior pixel image information representing a prior image;
 storing next pixel image information, the next pixel image information representing a next image; and
 generating 64-pixel blocks of spatially interpolated image information in response to the prior pixel image information and in response to the next pixel image information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 71):

Generating 64-pixel blocks of spatially interpolated image information in response to the prior and next pixel image information is provided by Tescher by block 12', which spatially interpolates back to the original blocks by interpolative processing in the paragraph bridging cols. 10-11, c. 11, lines 3-10, lines 46-51, and c. 12, lines 13-17.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 115:

115. A process comprising the acts of:
 storing prior pixel image information, the prior pixel image information representing a prior image;
 storing next pixel image information, the next pixel image information representing a next image; and
 generating 64-pixel blocks of spatially interpolated image information in response to the prior pixel image information and in response to the next pixel image information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 71):

For claim 380, memory means for storing pixel image information is provided by Tescher by at least block 13 in Fig. 1.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 380:

380. A system comprising:
memory means for storing pixel image information;
means for generating weight information;
means for generating scale factor information; and
means for generating scaled weighted image information in
response to the pixel image information stored in the memory means, in
response to the scale factor information, and in response to the weight
information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 70):

Means for generating weight information is provided by Tescher in at least the paragraph bridging cols. 5-6, where weight information is explicitly generated by specific circuitry depending whether the sample is prior or next.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 380:

380. A system comprising:
 memory means for storing pixel image information;
 means for generating weight information;
 means for generating scale factor information; and
 means for generating scaled weighted image information in
 response to the pixel image information stored in the memory means, in
 response to the scale factor information, and in response to the weight
 information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 71):

Means for generating scale image information is provided by Tescher by scaling the video frame using subsampling by a scale factor of four as noted in the paragraph bridging cols. 10-11 and the chrominance components are also scaled down by averaging as noted in c. 11, lines 3-48.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Tescher does not even mention “scaling” at “the paragraph bridging cols. 10-11” or at “c. 11, lines 3-48”. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 380:

380. A system comprising:
 memory means for storing pixel image information;
 means for generating weight information;
 means for generating scale factor information; and
 means for generating scaled weighted image information in
 response to the pixel image information stored in the memory means, in
 response to the scale factor information, and in response to the weight
 information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 71):

Means for generating scaled weighted image information in response to the pixel image information stored in the memory means, in response to the scale factor information, and in response to the weight information is provided by Tescher where cited above, where not only is it clear that the scaling and weighting factors are generated (e.g. various fractions as explicitly disclosed), but that these factors for both scaling and weighting are used.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Tescher does not even mention “scaling” or “scale factor”. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 380:

380. A system comprising:
 memory means for storing pixel image information;
 means for generating weight information;
 means for generating scale factor information; and
 means for generating scaled weighted image information in
 response to the pixel image information stored in the memory means, in

response to the scale factor information, and in response to the weight information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 71-72):

Teschler also discloses storing prior and next pixel image information representing a prior and next image is provided by Tescher by image memory block 13 in Fig. 1 and as noted in the paragraph bridging cols. 5-6, which stores a previous and next image. Furthermore/alternatively, next pixel images are also provided by memory 14 in Fig. 1 and as noted in the first full paragraph in c. 6, where Tescher explicitly teaches updating the memory with new image information in the form of 64-pixel blocks.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 380:

380. A system comprising:
 memory means for storing pixel image information;
 means for generating weight information;
 means for generating scale factor information; and
 means for generating scaled weighted image information in
 response to the pixel image information stored in the memory means, in
 response to the scale factor information, and in response to the weight
 information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 72):

Generating spatially interpolated image information in response to the prior pixel image information and in response to the next pixel image information is provided by Tescher by interpolation in at least the paragraph bridging cols. 10-11.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 380:

380. A system comprising:
memory means for storing pixel image information;
means for generating weight information;
means for generating scale factor information; and
means for generating scaled weighted image information in response to the pixel image information stored in the memory means, in response to the scale factor information, and in response to the weight information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 72):

Tescher also discloses storing prior and next pixel image information representing a prior and next image is provided by Tescher by image memory block 13 in Fig. 1 and as noted in the paragraph bridging cols. 5-6, which stores a previous and next image. Furthermore/alternatively, next pixel images are also provided by memory 14 in Fig. 1 and as noted in the first full paragraph in c. 6, where Tescher explicitly teaches updating the memory with new image information in the form of 64-pixel blocks. Explicit reference to frames of image information is provided by Tescher in at least the paragraph bridging cols. 10-11.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 380:

380. A system comprising:
 memory means for storing pixel image information;
 means for generating weight information;
 means for generating scale factor information; and
 means for generating scaled weighted image information in
 response to the pixel image information stored in the memory means, in
 response to the scale factor information, and in response to the weight
 information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 72):

Generating transformed image information in response to the
 frame of prior pixel image information and in response to the frame of
 next pixel image information is provided by transformation block 20 in
 Fig. 1 of Tescher.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 380:

380. A system comprising:
 memory means for storing pixel image information;
 means for generating weight information;

means for generating scale factor information; and
 means for generating scaled weighted image information in
 response to the pixel image information stored in the memory means, in
 response to the scale factor information, and in response to the weight
 information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the "in response to" claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

7.7.4.8 The § 102 rejection over Jain

The Examiner states (instant Action at 72):

15. Claims 113, 125, 127, 198, 223, 238 and 261 as well as the remaining pending claims are rejected under 35 U.S.C. § 102(b) as being anticipated by Jain et al. ("Displacement Measurement and Its Application in Interframe Image Coding", IEEE Transactions on Communications, vol. COM-29, No. 12, December 1981).

Jain discloses storing prior and next pixel image information representing a prior and next image is provided by Jain by the frame memories in Figs. 6b and 9 on pages 1805 and 1807.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Jain's Fig. 9 appears to be a simplified version of Fig. 6B, not prior and next image information. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 198, 223, and 238; respectively:

198. A process comprising the acts of:
 storing pixel image information in a memory;
 generating subpixel difference image information having subpixel
 resolution in response to the pixel image information and in response to
 feedback information; and

generating the feedback information in response to the subpixel difference image information.

223. A process comprising the acts of:
 storing prior pixel image information representing a prior image;
 storing next pixel image information representing a next image;
 generating subpixel vector change information having subpixel resolution in response to the prior pixel image information and in response to the next pixel image information; and
 generating transformed image information in response to the prior pixel image information and in response to the next pixel image information.

238. A process comprising the acts of:
 storing a frame of prior pixel image information representing a prior image;
 storing a frame of next pixel image information representing a next image;
 generating subpixel vector change information having subpixel resolution in response to the frame of prior pixel image information and in response to the frame of next pixel image information;
 generating weight information; and
 generating weighted image information in response to the frame of prior pixel image information, in response to the frame of next pixel image information, and in response to the weight information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 73):

Generating temporally interpolated image information in response to the prior pixel image information and in response to the next pixel image information is provided by Jain by equations 24 and 25 on page 1803 and the accompanying text.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1).

Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Jain does not support the Examiner's statement. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 198, 223, and 238; respectively:

198. A process comprising the acts of:
 storing pixel image information in a memory;
 generating subpixel difference image information having subpixel resolution in response to the pixel image information and in response to feedback information; and
 generating the feedback information in response to the subpixel difference image information.

223. A process comprising the acts of:
 storing prior pixel image information representing a prior image;
 storing next pixel image information representing a next image;
 generating subpixel vector change information having subpixel resolution in response to the prior pixel image information and in response to the next pixel image information; and
 generating transformed image information in response to the prior pixel image information and in response to the next pixel image information.

238. A process comprising the acts of:
 storing a frame of prior pixel image information representing a prior image;
 storing a frame of next pixel image information representing a next image;
 generating subpixel vector change information having subpixel resolution in response to the frame of prior pixel image information and in response to the frame of next pixel image information;
 generating weight information; and
 generating weighted image information in response to the frame of prior pixel image information, in response to the frame of next pixel image information, and in response to the weight information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 73):

Generating transformed image information in response to the temporally interpolated image information, in response to the prior pixel image information, and in response to the next pixel image information is provided by transforming the motion compensated image by a 2-D DCT (i.e. Discrete Cosine Transform) in Figs. 6b and differentially by the 2-D DCT in Fig. 9.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Jain does not support the Examiner’s statement. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 198, 223, and 238; respectively:

198. A process comprising the acts of:
 storing pixel image information in a memory;
 generating subpixel difference image information having subpixel resolution in response to the pixel image information and in response to feedback information; and
 generating the feedback information in response to the subpixel difference image information.

223. A process comprising the acts of:
 storing prior pixel image information representing a prior image;
 storing next pixel image information representing a next image;
 generating subpixel vector change information having subpixel resolution in response to the prior pixel image information and in response to the next pixel image information; and

generating transformed image information in response to the prior pixel image information and in response to the next pixel image information.

238. A process comprising the acts of:
 storing a frame of prior pixel image information representing a prior image;
 storing a frame of next pixel image information representing a next image;
 generating subpixel vector change information having subpixel resolution in response to the frame of prior pixel image information and in response to the frame of next pixel image information;
 generating weight information; and
 generating weighted image information in response to the frame of prior pixel image information, in response to the frame of next pixel image information, and in response to the weight information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 73):

Jain discloses a first and second memory for storing prior and next pixel image information representing a prior and next image is provided by Jain by the frame memories in Figs. 6b and 9 on pages 1805 and 1807 respectively, where both memories provide for storing image frames in sequence, so that both provide for storing prior and next image information.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Jain’s Fig. 9 appears to be a simplified version of Fig. 6B, not prior and next image information. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 198, 223, and 238; respectively:

198. A process comprising the acts of:
 storing pixel image information in a memory;
 generating subpixel difference image information having subpixel resolution in response to the pixel image information and in response to feedback information; and
 generating the feedback information in response to the subpixel difference image information.

223. A process comprising the acts of:
 storing prior pixel image information representing a prior image;
 storing next pixel image information representing a next image;
 generating subpixel vector change information having subpixel resolution in response to the prior pixel image information and in response to the next pixel image information; and
 generating transformed image information in response to the prior pixel image information and in response to the next pixel image information.

238. A process comprising the acts of:
 storing a frame of prior pixel image information representing a prior image;
 storing a frame of next pixel image information representing a next image;
 generating subpixel vector change information having subpixel resolution in response to the frame of prior pixel image information and in response to the frame of next pixel image information;
 generating weight information; and
 generating weighted image information in response to the frame of prior pixel image information, in response to the frame of next pixel image information, and in response to the weight information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 73):

A spatial interpolation circuit generating spatially interpolated image information in response to prior pixel image information and in response to next pixel image information is provided by Jain, because the interpolation of Jain is a spatial-temporal interpolation, since,

equations 24 and 25 on page 1803 and the accompanying text clearly reveal that the coordinates m and n are spatial coordinates of a particular block before and after spatial displacement. See also the first paragraph on page 1802, for the spatial displacement, and equations 7-9, which show that the motion compensation, which provides for interpolation noted above, also clearly calculates a spatial displacement of pixel information by using interpolation between prior and next frames.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Jain does not support the Examiner's statement. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 198, 223, and 238; respectively:

198. A process comprising the acts of:
 storing pixel image information in a memory;
 generating subpixel difference image information having subpixel resolution in response to the pixel image information and in response to feedback information; and
 generating the feedback information in response to the subpixel difference image information.

223. A process comprising the acts of:
 storing prior pixel image information representing a prior image;
 storing next pixel image information representing a next image;
 generating subpixel vector change information having subpixel resolution in response to the prior pixel image information and in response to the next pixel image information; and
 generating transformed image information in response to the prior pixel image information and in response to the next pixel image information.

238. A process comprising the acts of:
 storing a frame of prior pixel image information representing a prior image;

storing a frame of next pixel image information representing a next image;
 generating subpixel vector change information having subpixel resolution in response to the frame of prior pixel image information and in response to the frame of next pixel image information;
 generating weight information; and
 generating weighted image information in response to the frame of prior pixel image information, in response to the frame of next pixel image information, and in response to the weight information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 73-74):

A transform image processor coupled to the spatial interpolation circuit, the transform processor generating transformed image information in response to the spatially interpolated image information generated by the spatial interpolation circuit, in response to the prior pixel image information, and in response to the next pixel image information is provided by transforming the motion compensated image by a 2-D DCT (i.e. Discrete Cosine Transform) in Figs. 6b and differentially by the 2-D DCT in Fig. 9 on pages 1805 and 1807 respectively.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Jain does not support the Examiner’s statement. Further, Jain’s Fig. 9 appears to be a simplified version of Fig. 6B. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 198, 223, and 238; respectively:

198. A process comprising the acts of:
 storing pixel image information in a memory;

generating subpixel difference image information having subpixel resolution in response to the pixel image information and in response to feedback information; and

generating the feedback information in response to the subpixel difference image information.

223. A process comprising the acts of:

storing prior pixel image information representing a prior image;

storing next pixel image information representing a next image;

generating subpixel vector change information having subpixel resolution in response to the prior pixel image information and in response to the next pixel image information; and

generating transformed image information in response to the prior pixel image information and in response to the next pixel image information.

238. A process comprising the acts of:

storing a frame of prior pixel image information representing a prior image;

storing a frame of next pixel image information representing a next image;

generating subpixel vector change information having subpixel resolution in response to the frame of prior pixel image information and in response to the frame of next pixel image information;

generating weight information; and

generating weighted image information in response to the frame of prior pixel image information, in response to the frame of next pixel image information, and in response to the weight information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 74):

For claim 113, storing a frame of prior and next pixel image information representing a prior and next image respectively is provided by Jain by the frame memories in Figs. 6b and 9 on pages 1805 and 1807 respectively, each memory storing prior and next frames in time, since the images are in a video sequence.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Jain's Fig. 9 appears to be a simplified version of Fig. 6B, not prior and next image information. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 113:

113. A process comprising the acts of:
 storing a frame of prior pixel image information, the frame of
 prior pixel image information representing a prior image;
 storing a frame of next pixel image information, the frame of
 next pixel image information representing a next image; and
 generating subpixel change information having subpixel
 resolution by subtracting between the frame of prior pixel image
 information and the frame of next pixel image information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the "in response to" claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 74):

Generating subpixel change information having subpixel resolution by subtracting between the prior and next frames is provided by Jain by subtracting prior and next frames using the subtracter in Figs. 6b and 9 on pages 1805 and 1807 respectively, and alternatively by determining the positional change between the two frames (i.e. displacement) by finding a displacement vector as shown in Fig. 6b and 9 on pages 1805 and 1807 respectively, and further in the first full paragraph on page 1802, which provides for fractional, i.e. sub, pixel displacement, and subpixel resolution, since Jain teaches higher levels of accuracy using more pixels due to the addition of fractional pixels to the integer pixels, and can also interpolate between the displacements for higher accuracy, which appears to be in line with Applicant's specification for what Applicant regards subpixel.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Jain's Fig. 9 appears to be a simplified version of Fig. 6B, not prior and next image information. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 113:

113. A process comprising the acts of:
 storing a frame of prior pixel image information, the frame of
 prior pixel image information representing a prior image;
 storing a frame of next pixel image information, the frame of
 next pixel image information representing a next image; and
 generating subpixel change information having subpixel
 resolution by subtracting between the frame of prior pixel image
 information and the frame of next pixel image information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the "in response to" claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 74-75):

Jain discloses a transform processor generating transformed image information in response to the prior and next pixel image information is provided by the 2-D DCT (i.e. discrete cosine transform) processor explicitly shown in Figs. 6b and 9 on pages 1805 and 1807 respectively, which clearly transforms in response to the displacement (i.e. subpixel vector change information) of Jain in the first full paragraph on page 1802.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Jain's Fig. 9 appears to be a simplified version of Fig. 6B, not prior and next image information. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 113:

113. A process comprising the acts of:
 storing a frame of prior pixel image information, the frame of
 prior pixel image information representing a prior image;
 storing a frame of next pixel image information, the frame of
 next pixel image information representing a next image; and
 generating subpixel change information having subpixel
 resolution by subtracting between the frame of prior pixel image
 information and the frame of next pixel image information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the "in response to" claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 75):

Jain discloses a motion compensated image frame u_f , in Figs. 6b and 9 of Jain on pages 1805 and 1807 respectively, provides for delta subpixel image information, because the motion compensated image is an image that accounts for the delta positional displacement vector between frames. This is clearly shown in the figures, where a displacement vector is used to derive the motion compensated image between frames. Therefore, it should be clear that delta subpixel image information having subpixel resolution by subtracting in response to the pixel image information stored in the memory is provided by Jain.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Jain's Fig. 9 appears to be a simplified version of Fig. 6B. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 113:

113. A process comprising the acts of:
 storing a frame of prior pixel image information, the frame of prior pixel image information representing a prior image;
 storing a frame of next pixel image information, the frame of next pixel image information representing a next image; and
 generating subpixel change information having subpixel resolution by subtracting between the frame of prior pixel image information and the frame of next pixel image information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 75):

Furthermore, generating this delta subpixel image information, which as noted above, can correspond to the motion compensated image of Jain, clearly also takes feedback as also explicitly shown in Figs. 6b and 9 of Jain on pages 1805 and 1807 from both feedback from the motion compensated image and also from feedback of an inverse transformed quantized error image. Thus, in response to the feedback information, and generating the feedback information in response to the delta subpixel image information is clearly provided by Jain.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Jain’s Fig. 9 appears to be a simplified version of Fig. 6B. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 113:

113. A process comprising the acts of:

storing a frame of prior pixel image information, the frame of prior pixel image information representing a prior image;
 storing a frame of next pixel image information, the frame of next pixel image information representing a next image; and
 generating subpixel change information having subpixel resolution by subtracting between the frame of prior pixel image information and the frame of next pixel image information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 75):

A display product is provided by Jain in at least the first full paragraph of the Introduction on page 1799, where many such products are produced by the numerous applications listed, e.g. a television product image, a medical image, etc.

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Jain does not support the Examiner’s contention. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 113:

113. A process comprising the acts of:
 storing a frame of prior pixel image information, the frame of prior pixel image information representing a prior image;
 storing a frame of next pixel image information, the frame of next pixel image information representing a next image; and
 generating subpixel change information having subpixel resolution by subtracting between the frame of prior pixel image information and the frame of next pixel image information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the "in response to" claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

7.7.4.9 The § 102 rejection over Fant

The Examiner states (instant Action at 75-77):

16. Claims 105, 106, 107, 108, 118, 119, 123, 124, 126, 135, 137, 143, 145, 148, 153, 157, 188, 189, 197, 201, 203, 204, 206, 212, 214, 215, 218, 228, 231, 249, 255, 264, 267, 388, 525, 527, 533, 535, 539, 553, 555, 557, 559, 561, 564, 573, 575, 578 and 580 are rejected under 35 U.S.C. 102(e) as being anticipated by Fant (US 4,835,532 A). The following is a description of the Fant reference as it is applied to the claims. Due to the large number of claims at issue, one claim will be exemplified, followed by an explanation of where the remaining claim features are disclosed by Fant.

EXAMPLE CLAIM - 189

A process comprising the acts of:
storing computer instructions

The entire system is computer controlled, and thus operates from stored computer programs. Each processing block shown in figure 3 has it's own sub-program. For example, see "programs are short for each process" at column 21, line 66, and "the FOV program" at column 27, line 25. Collectively, all of the sub-programs for each of the modules are a "computer program" as the entire system could not work without any one of them.

*generating television image information; and
figure 13, "TV Camera";
generating zoomed image information.*

Fant discloses displaying a moving 3D-perspective image simulating an observer roaming through an environment and zooming-in on features of interest in the environment to examine the features of interest in response to the display image information (col. 4, line 49-col. 5, line 31 and col. 14, line 57-col. 15, line 17). Fant explains that the helicopter simulator system provides continuous helicopter pilot eye-view image scenes corresponding to the gaming area, wherein the gaming area includes a variety of features of interest (figure 12). Fant further explains that the system generates the continuous image scenes in response to controls (driving function) for guiding or navigating

the helicopter in any direction in the gaming area. For instance, if the helicopter -was operated to head towards a feature of interest such as the tank in figure 12, then the tank in each of the eye-view image scenes -would zoom-in as the helicopter approaches it. Accordingly, the guidance of the helicopter simulator towards a feature of interest provides a zooming-in on the feature of interest, and allows the feature of interest to be examined in response to the display image information (eye-view scenes).

Likewise, Fant anticipates the other identified claims as described in the following discussion of the Fant reference.

Fant discloses:

However, the instant claimed invention is not identically shown in this reference, the requirement that every claim limitation be identically shown by the reference is not met (e.g.; Sections 7.6.5 and 7.7.1). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner has not specifically identified which part of Fant is relied upon (Section 7.6.6). Hence, the instant rejection fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 106, 119, and 553; respectively:

106. A process comprising the acts of:
storing computer instructions;
generating infra-red image information; and
generating temporally interpolated image information in
response to the infra-red image information and in response to the
computer instructions.

119. A system comprising:
an integrated circuit multibit memory having a plurality of multibit
memory cells, each of the plurality of multibit memory cells storing at
least two digital bits of information;
an integrated circuit multibit memory accessing circuit generating
accessed digital information in response to the at least two digital bits of
information stored in each of the plurality of multibit memory cells; and
a processor generating kernel filtered image information in
response to the accessed digital information.

553. A process comprising the acts of:
storing computer instructions;

generating navigation information in response to the computer instructions;
generating radar information;
generating pattern recognition information in response to the computer instructions and in response to the radar information; and
inputting database information into a database memory in response to the computer instructions and in response to the radar information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

7.8 THE 35 USC § 103 OBVIOUSNESS REJECTIONS

The Appellant traverses the § 103 obviousness rejections for the reasons discussed in Sections 7.6 and 7.8.1 et seq.

7.8.1 The § 103 Rejections Violate The Law Of The Federal Circuit By Failing To Properly Consider Each Claim As A Whole, Instead Separately Addressing Individual Limitations In A Vacuum

The CCPA required the Examiner to consider each claim as a whole.

In determining patentability, however, we are not concerned with the obviousness *of each bit* when dissected out and after considering the applicant's disclosure, but with the obviousness of his *whole* invention as claimed.

Buehler.³³⁴

The Federal Circuit requires the Examiner to consider each claim as a whole and to construe each contested claim in view of the prior art and the disclosure regarding § 103.

Under section 103, the board cannot dissect a claim, excise the printed matter from it, and declare the remaining portion of the mutilated claim to be unpatentable. The claim must be read as a whole.

[FN] 35 U.S.C. § 103 (1976) specifically provides that:

"A patent may not be obtained . . . if the differences between the subject matter sought to be patented and the prior art are such that *the subject matter as a whole* would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. . . . (Emphasis supplied.)

If the board meant to disregard that basic principle of claim interpretation, we must reverse the rejection as a matter of law.

Gulack.³³⁵ However, the Examiner has failed to properly construe the rejected claims (Sections 7.3.5.1, 7.2.6, and 7.6.4) nor to properly consider each claim as a whole. Hence, for this additional reason, the § 103 rejections should be reversed.

³³⁴ In re Buehler, 515 F.2d 1134, 1140, 185 USPQ 781, 786 (CCPA 1975) (quoting Harpman v. Watson, Comm'r. Pats., 181 F. Supp 919, 923, 124 USPQ 169, 173 (D.D.C. 1959)) (emphasis in original).

Because the references do not teach the claimed invention as a whole, the Examiner has adapted a method of isolating one claim limitation at a time and creating an erroneous conclusory reason why it alone is allegedly-obvious. Even worse, the Examiner does this without the required claim construction (Sections 7.3.5.1, 7.2.6, and 7.6.4) and without the required Gechter, Rouffet, and Graham analyses (Section 7.8.8). Yet worse, the Examiner misrepresents the references and what they fairly teach.

Even worse, the Examiner not only selectively addresses individual claim limitations separately, disregarding the claim as a whole, but does **not** even rely on the references for teaching certain claim limitations. However, this cannot save a fatally defective § 103 rejection. The law is clear, obviousness involves the motivation for making the combination, not merely finding the individual limitations in the prior art.

Although an element may be known in certain prior art systems, a novel combination of old elements is certainly patentable. The Federal Circuit reiterated the requirement for motivation to combine in order to support a § 103 rejection of a claimed combination of prior art elements:

Most if not all inventions arise from a combination of old elements Thus, every element of a claimed invention may often be found in the prior art However, identification in the prior art of each individual part claimed is insufficient to defeat patentability of the whole claimed invention.... Rather, to establish obviousness based on a combination of the elements disclosed in the prior art, there must be some motivation, suggestion or teaching of the desirability of making the specific combination that was made by the applicant Even when obviousness is based on a single prior art reference, there must be a showing of [sic or] a suggestion or motivation to modify the teachings of that reference.

Kotzab.³³⁶

“[V]irtually all inventions are ‘combinations’, and ... every invention is formed of ‘old elements’.... Only God works from nothing. Man must work with old elements[.]”

³³⁵ In re Gulack, 703 F.2d 1381, 217 USPQ 401 (Fed. Cir. 1983) (emphasis added) (alteration in original).

³³⁶ In re Kotzab, 217 F.3d 1365, 55 USPQ2d 1313 (Fed. Cir. 2000).

Wright.³³⁷ Just because elements may have existed in the prior art does not mean that the elements were combined in the claimed manner or that they cooperate in the claimed manner. Hence, a finding of bits-and-pieces in the prior art does not establish obviousness of the combination.

The MPEP states regarding enablement:

Accordingly, the first analytic step requires that the Examiner determine **exactly** what subject matter is encompassed by the claims. The examiner should determine what **each claim** recites and what the subject matter is when the claim is considered as a whole, not when its parts are analyzed individually. **No claim shall be overlooked**

MPEP 2164.08 (bold emphasis added, underline in original).

7.8.2 The § 103 Rejections Do Not Establish A Prima Facie Case

The § 103 rejections do not establish a prima facie case³³⁸, as discussed below.

The failure of the Examiner to establish a prima facie case is, by itself, dispositive of the § 103 rejections. Judge Hairston in Hyatt-'852³³⁹ stated:

Without a showing that each and every limitation of the claimed invention is found in the Schutt reference, either explicitly or inherently, the anticipation rejection is reversed....

For all of the reasons set forth in the immediately preceding paragraph, the obviousness rejection based upon the combined teachings of Schutt and Sundet is reversed for lack of a prima facie case of obviousness. Without an initial prima facie case, the burden never shifted to appellant to provide a rebuttal. In re Oetiker 977 F.2d 1443, [] 24 USPQ2d 1443, 1444 (Fed. Cir. 1992)....

As indicated supra, the mere listing of elements does not satisfy the examiner's burden of presenting a prima facie case of obviousness of the claims as a whole.

³³⁷ In re Wright, 848 F.2d 1216, 6 USPQ2d 1959, 1962 (Fed. Cir. 1988) (quoting Howard T. Markey, Why Not The Statute?, 65 J. Pat. Off. Soc'y 331, 333-34 (1988) (emphasis, ellipsis, and quotes in original)).

³³⁸ See 37 CFR 1.106(b); Chester v. Miller, 906 F.2d 1574, 1578, 15 USPQ2d 1333, 1337 (Fed. Cir. 1990) ("Section 132 is violated when a rejection is so uninformative that it prevents the applicant from recognizing and seeking to counter the grounds for rejection."). See also In re Oetiker, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992).

³³⁹ Ex parte Hyatt, Appeal No. 2001-2172, Paper No. 31 at 8-9 in patent application Serial No. 08/436,852 (PTO Bd. App. July 25, 2002) [herein Hyatt-'852] (unpublished PTO decision) (footnote removed).

Similarly, the Examiner herein has failed to establish a prima facie case, which is dispositive of the § 103 rejections.

The Examiner must support § 103 rejections with a proper explanation of why the claims are rendered obvious by the references. The legal concept of prima facie obviousness is a procedural tool of examination which applies broadly to all arts. It allocates who has the burden of going forward with production of evidence in each step of the examination process. See MPEP 2142. Such support of the § 103 rejections require an evaluation of the claims as a whole, the references as a whole, a proper construction of each of the rejected claims to determine each claim's scope and meaning, a proper limitation-by-limitation analysis of each claim element, a proper claim-by-claim analysis of each of the claims subject to rejection, and consideration of all of the words in each claim. These legal requirements, which have been established by case law, must, in conjunction with a Graham analysis, be present in any § 103 rejection in order to establish a prima facie case.

The instant § 103 rejections fail to properly evaluate the claim differences, which is fatal to the § 103 rejections.

Appellant was entitled to have differences between the claimed invention, the subject matter as a whole, and the prior art references of record evaluated This the examiner failed to do.

Lunsford.³⁴⁰

A Graham analysis requires that the Examiner determine the scope and content of the prior art, ascertain the differences between the prior art and the claims in issue, resolve the level of ordinary skill in the pertinent art, and evaluate evidence of secondary considerations. However, the § 103 rejections do not even address these requirements much less satisfy these requirements (Section 7.8.8).

Establishing a prima facie case of obviousness requires meeting three basic Graham criteria. See MPEP 2143. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to an artisan, to modify the reference or to combine reference teachings (the references must also suggest the desirability of the modification or combination). Second, there must be a reasonable expectation of success in making the modification or combination. Third, the

³⁴⁰ In re Lunsford, 357 F.2d 385, 391, 148 USPQ 721, 725 (CCPA 1966).

reference (or references when combined) must teach or suggest all of the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on the applicant's disclosure. See Vaeck.³⁴¹ See also MPEP 2142. Because the § 103 rejections are not supported by the required analysis, the § 103 rejections fail to establish a prima facie case.

As discussed above, it is black-letter law that the reference must provide the motivation -- it is improper hindsight, as with the instant § 103 rejections, to use the Appellant's disclosure to provide motivation for the prior art. The reference must select the components -- it is improper hindsight, as with the instant § 103 rejections, to use the components selected and disclosed by the Appellant. The reference must also provide the interconnections -- it is improper to rely on the references to connect themselves, as with the instant § 103 rejections.

The Board in Levengood³⁴² made clear that some objective reason to combine the teachings of the references is necessary. The mere statement that the modification would have been within the skill of the art is not sufficient to establish a prima facie case. See MPEP 2143.01. The instant § 103 rejections therefore fail to establish a prima facie case of obviousness.

The § 103 rejections further fail to establish a prima facie case for the reasons discussed below.

- a. The Examiner did not resolve the level of ordinary skill in the pertinent art (MPEP 2141).
- b. The Examiner did not evaluate secondary considerations (MPEP 2141).
- c. The Federal Circuit requires a limitation-by-limitation analysis, but the § 103 rejections do not properly provide a claim-by-claim analysis (Section 7.6.2) much less a limitation-by-limitation analysis..
- d. The references do not suggest the desirability and thus the obviousness of making the combination (MPEP 2141).
- e. The Examiner views the references with impermissible hindsight obtained from the claimed invention (MPEP 2141 and Sections 7.8.3 and 7.8.4).

³⁴¹ In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

³⁴² Ex parte Levengood, 28 USPQ2d 1300, 1301 (Bd. Pat. App. & Int. 1993).

- f. The § 103 rejections do not establish a reasonable expectation of success as the standard with which obviousness is determined³⁴³ (MPEP 2141).
- g. The § 103 rejections rely on unsupported and conclusory statements about the references but do not properly establish motivation for an artisan to make the combination.
- h. The § 103 rejections do not establish in what manner an artisan would combine the elements in the references.
- i. The § 103 rejections do not establish why an artisan would expect the combination of references to operate properly or to operate in the claimed manner.
- j. The § 103 rejections do not properly consider the claimed invention as a whole (MPEP 2141).
- k. The § 103 rejections do not properly consider the references as a whole (MPEP 2141).
- l. The § 103 rejections disregard relevant claim limitations.
- m. The § 103 rejections are based upon unsupported and conclusory statements regarding obviousness and skill in the art but do not provide proper support for such statements.
- n. The Examiner has not established how the references render obvious the distinguishing limitations of the instant claims.
- o. The Examiner did not properly determine the scope and content of the prior art (MPEP 2141).
- p. The Examiner did not properly ascertain the differences between the prior art and the claims in issue (MPEP 2141).
- q. The § 103 rejections do not provide acceptable evidence or reasoning.

³⁴³ See Hodesch v. Block Drug Co. Inc., 786 F.2d 1136, 1143 n.5, 229 USPQ 182, 187 n.5 (Fed. Cir. 1986).

- r. The § 103 rejections do not establish motivation for combining references (Sections 7.8.5).
- s. The Appellant properly traversed the Examiner's unsupported statements, but the Examiner did not provide the required reference or affidavit in accordance with MPEP 2144.03.

Judge Fleming in Hyatt-'041³⁴⁴ stated:

OPINION

We will not sustain the rejection ... under 35 U.S.C. 103.

The Examiner has failed to set forth a prima facie case. It is the burden of the Examiner to establish why one having ordinary skill in the art would have been led to the claimed invention by the reasonable teachings or suggestions found in the prior art, or by a reasonable inference to the artisan contained in such teachings or suggestions. In re Sernaker, 702 F.2d 989, 217 USPQ 1 (Fed. Cir. 1983).

The burden of establishing a prima facie case is not satisfied by a mere matching up of elements in a reference with elements in a claim. See Hyatt-'041 (overturning a rejection which matched up a claimed detector with a prior art decoder). See also Edwards and Oetiker.³⁴⁵

This is further supported by Judge Lee in Hyatt-'570³⁴⁶:

The "broadest reasonable" interpretation of the claims still has to be reasonable.

Judge Lee in Hyatt-'570³⁴⁷ further stated:

We see no reason why such disclosure would have led one with ordinary skill in the art at the time of appellant's invention to think that the device can be operated to produce a range of selectable responses.

³⁴⁴ Ex parte Hyatt, Appeal No. 94-4132, Paper No. 28 at 4 in patent application Serial No. 07/578,041 which issued as U.S. Patent No. 5,526,506 on June 11, 1996 (PTO Bd. App. October 31, 1995) [herein Hyatt-'041] (unpublished PTO decision).

³⁴⁵ In re Edwards, 568 F.2d 1349, 1354, 196 USPQ 465, 469 (CCPA 1978); In re Oetiker, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992).

³⁴⁶ Ex parte Hyatt, Appeal No. 95-4759, Paper No. 30 at 8 in patent application Serial No. 07/357,570 (PTO Bd. App. September 25, 1996) [herein Hyatt-'570] (unpublished PTO decision).

³⁴⁷ Ex parte Hyatt, Appeal No. 95-4759, Paper No. 30 at 44 and 47 in patent application Serial No. 07/357,570 (PTO Bd. App. September 25, 1996) [herein Hyatt-'570] (unpublished PTO decision).

The examiner has not established that one with ordinary skill in the art at the time of the appellant's invention possessed as common sense and rudimentary skill a working knowledge that liquid crystal devices such as Heilmeier's can be alternatively constructed to provide a range of various selectable responses. For that reason alone, the rejection is improper. * * *

For the foregoing reasons, the rejection ... under 35 U.S.C. § 103 for obviousness over Stevens, Mengert, Heilmeier, and Moss is reversed.

As in Hyatt-'570, in the instant application, "[t]he examiner has not established that one with ordinary skill in the art at the time of the appellant's invention possessed as common sense and rudimentary skill a working knowledge" to construct the claimed invention from the references. "For that reason alone, the rejection is improper."

Judge Lee in Hyatt-'570³⁴⁸ further stated:

In that connection, there is no logical reason why a liquid crystal device would have been coupled to the duty cycle circuit and generate duty cycle controlled illumination in response to a duty cycle signal from the duty cycle circuit. There also is no logical reason why the duty cycle circuit would have been coupled to Fleming's capacitors 19 to receive the analog signal stored therein.

None of the foregoing has been adequately explained by the examiner. * * *

For the foregoing reasons, the rejection of claim 5 under § 103 for obviousness over Fleming, Heilmeier, and Engel is reversed.

As in Hyatt-'570, in the instant application the Examiner has not properly provided a logical reason nor an adequate explanation for why the references render obvious the claims.

The burden of establishing a prima facie case rests with the Examiner³⁴⁹ and is not satisfied by mere conclusory statements.³⁵⁰ Rather, the Examiner must support a § 103 rejection with a proper

³⁴⁸ Ex parte Hyatt, Appeal No. 95-4759, Paper No. 30 at 35-36 in patent application Serial No. 07/357,570 (PTO Bd. App. September 25, 1996) [herein Hyatt-'570] (unpublished PTO decision).

³⁴⁹ In re Piasecki, 745 F.2d 1468, 223 USPQ 785 (Fed. Cir. 1984).

³⁵⁰ In re Edwards, 568 F.2d 1349, 1354, 196 USPQ 465, 469 (CCPA 1978); In re Oetiker, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992).

explanation of why the claims are obvious and must provide acceptable evidence or reasoning in the explanation.³⁵¹ However, the instant § 103 rejections provide neither a proper explanation nor acceptable evidence or reasoning.

The Appellant has established that there are novel differences between the instant claims and the references. However, the § 103 rejections do not establish that these novel differences are obvious (Section 5.1 and 7.8.9).

The prior art must teach or suggest all of the claim limitations to support a § 103 rejection. See Royka.³⁵² See also MPEP 2143.03. However, the instant § 103 rejections do not properly establish that the references teach or suggest each of the claim limitations.

The § 103 rejections fail to properly consider important claim limitations even though a § 103 rejection must consider all of the limitations in the claims. See Wilson.³⁵³ See also MPEP 2143.03 and Sections 5.1, 7.6.2 and 7.8.9 herein.

In order to establish a prima facie case, each rejected claim must be evaluated individually to determine whether the individual claim is rendered obvious by the references, particularly where, as here, the distinctions of the claims are separately argued. See, e.g., Sections 5 and 7.1. However, the Examiner did not properly evaluate each of the claims individually, thus the § 103 rejections fail to establish a prima facie case. See Van Geuns and Wright.³⁵⁴ See also Nielson and Beaver.³⁵⁵

The § 103 rejections do not properly acknowledge that different claims in the instant application recite different combinations of features than those taught by the references, much less properly read these different combinations of features on the references.

³⁵¹ In re Piasecki, 745 F.2d 1468, 223 USPQ 785 (Fed. Cir. 1984).

³⁵² In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974).

³⁵³ In re Wilson, 424 F.2d 1382, 165 USPQ 494, 496 (CCPA 1970).

³⁵⁴ In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993); In re Wright, 999 F.2d 1557, 27 USPQ2d 1510 (Fed. Cir. 1993).

³⁵⁵ In re Nielson, 816 F.2d 1567, 2 USPQ2d 1525 (Fed. Cir. 1987); In re Beaver, 893 F.2d 329, 13 USPQ2d 1409 (Fed. Cir. 1989).

Judge Lee in Hyatt-'570³⁵⁶ further stated:

The "broadest reasonable" interpretation of the claims still has to be reasonable In short, the examiner provides no indication that the prior art provides reasonable guidance on how to piece together a multitude of separate parts to arrive at the claimed invention.

* * *

For the foregoing reasons, the [§ 103] rejection ... is reversed.

As in Hyatt-'570, in the instant application, "the examiner provides no indication that the prior art provides reasonable guidance on how to piece together a multitude of separate parts to arrive at the claimed invention." Thus, the § 103 rejections should be reversed.

Judge Lee in Hyatt-'570³⁵⁷ further stated:

Without explaining how one would arrive at the particular structure required by the claims, the examiner has not made out a prima facie case that the claimed invention would have been rendered obvious by the prior art.

As in Hyatt-'570, in the instant application, "the examiner has not made out a prima facie case that the claimed invention would have been rendered obvious by the prior art."

Vice Chief Judge Harkcom in Hyatt-'061³⁵⁸, regarding a § 103 rejection, stated:

The examiner implies that the recited memory is well known in the memory art but provides no documentation of this despite a challenge from Appellant. Examiner's Answer at 14, lines 2-5; **Appeal Brief** at 10, lines 18-32. **Without such support we will not sustain the rejection on the present record.**

* * *

This rejection hinges on the examiner's finding that analog refresh circuits were well known in the art. Appellant has challenged that finding and the examiner has not supported the finding with any evidence in the present record. **Lacking such support, we are**

³⁵⁶ Ex parte Hyatt, Appeal No. 95-4759, Paper No. 30 at 8 and 46-47 in patent application Serial No. 07/357,570 (PTO Bd. App. September 25, 1996) [herein Hyatt-'570] (unpublished PTO decision).

³⁵⁷ Ex parte Hyatt, Appeal No. 95-4759, Paper No. 30 at 45 in patent application Serial No. 07/357,570 (PTO Bd. App. September 25, 1996) [herein Hyatt-'570] (unpublished PTO decision).

³⁵⁸ Ex parte Hyatt, Appeal No. 94-0665, Paper No. 28 at 17, 19, and 22-23 in patent application Serial No. 07/493,061 (PTO Bd. App. June 30, 1998) [herein Hyatt-'061] (unpublished PTO decision) (emphasis added).

constrained to reverse the rejection. Thus, the rejection of Claim 63 is not sustained on the present record.

* * *

This rejection hinges on the examiner's finding that analog refresh circuits were well known in the art. Appellant has challenged that finding and the examiner has not supported the finding with any evidence in the present record. **Lacking such support, we are constrained to reverse the rejection.** Thus, the rejection ... is not sustained on the present record.

The Board consistently found a lack of support for the rejections and based its decision to reverse various rejections upon such findings.

Judge Lee in Hyatt-'570³⁵⁹, regarding a § 103 rejection, stated:

We disagree with the examiner The examiner's conclusion is without adequate support in the record.

For this and other reasons, the Board reversed the § 103 rejection of claims 9 and 13. Id. at 27-32. As in Hyatt-'570, in the instant application, "[t]he examiner's conclusion is without adequate support in the record." Hence, the instant § 103 rejections should be reversed.

Judge Lee in Hyatt-'570³⁶⁰, regarding a § 103 rejection, stated:

Without explaining how one would arrive at the particular structure required by the claims, the examiner has not made out a prima facie case that the claimed invention would have been rendered obvious by the prior art.

Both Hyatt-'061 and Hyatt-'570 illustrate instances where the Examiner failed to establish a prima facie case and hence the related § 103 rejections were reversed. Similarly, in the instant application, the § 103 rejections fail to establish a prima facie case and thus should be reversed.

Judge Krass in Hyatt-'243³⁶¹, in reversing all of the rejections under § 102 and § 103, stated:

³⁵⁹ Ex parte Hyatt, Appeal No. 95-4759, Paper No. 30 at 29 and 32 in patent application Serial No. 07/357,570 (PTO Bd. App. September 25, 1996) [herein Hyatt-'570] (unpublished PTO decision).

³⁶⁰ Ex parte Hyatt, Appeal No. 95-4759, Paper No. 30 at 45 in patent application Serial No. 07/357,570 (PTO Bd. App. September 25, 1996) [herein Hyatt-'570] (unpublished PTO decision).

³⁶¹ Ex parte Hyatt, Appeal No. 92-1284, Paper No. 66 at 4-5 in patent application Serial No. 06/849,243 which issued as U.S. Patent No. 5,410,621 on April 25, 1995 (PTO Bd. App. May 17, 1994) [herein Hyatt-'243] (unpublished PTO decision) (emphasis added).

The examiner's approach appears to suggest that the generation of one certain frequency means that there is suppression of other frequencies and that somehow this equates to filter processing. **In our view, the examiner's interpretation is a stretch which goes beyond all bounds of reasonableness.**

In view of the above, the § 103 rejections do not establish a prima facie case. Hence, the § 103 rejections should be reversed.³⁶²

7.8.3 The § 103 Rejections Rely Upon Improper Hindsight

As discussed above, it is black-letter law that the reference must provide motivation -- and it is improper hindsight, as with the instant § 103 rejections, to use the Appellant's disclosure to provide motivation for the prior art. The prior art reference itself must select the components. The reference must also provide the interconnections -- it is improper to rely on the components to connect themselves.

The Federal Circuit has warned against "the hindsight trap". See Section 7.8.4 and particularly Kotzab.³⁶³ It is improper hindsight, as with the instant § 103 rejections, to use the Appellant's own disclosure to provide motivation to combine the references. The law clearly establishes that the test for obviousness must be made based upon the invention as a whole to a person of ordinary skill in the art at the time the invention was made. Obviousness cannot be determined by relying upon an applicant's own disclosure.

The Federal Circuit explained about "the hindsight trap" in reversing an obviousness rejections in Kotzab.³⁶⁴

In this case, the Examiner and the Board fell into the hindsight trap. The idea of a single sensor ... is a technologically simple concept. With this simple concept in mind, the Patent and Trademark Office found prior art statements that ... appeared to suggest the claimed limitation. But, there was no finding as to the specific understanding or

³⁶² In re Oetiker, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992).

³⁶³ In re Kotzab, 217 F.3d 1365, 55 USPQ2d 1313, 1318 (Fed. Cir. 2000) (emphasis added).

³⁶⁴ In re Kotzab, 217 F.3d 1365, 55 USPQ2d 1313, 1318 (Fed. Cir. 2000) (emphasis added).

principle within the knowledge of a skilled artisan that would have motivated one with no knowledge of Kotzab's invention to make the combination in the manner claimed. In light of our holding of the absence of a motivation to combine the teachings in Evans, we conclude that the Board did not make out a proper prima facie case of obviousness

Similarly, in the instant application, by failing to properly establish "some motivation, suggestion or teaching" in the prior art to make the claimed combination, the Examiner failed to establish a prima facie case of obviousness and hence the Examiner "fell into the hindsight trap" (Section 7.8.4). Thus, the instant § 103 obviousness rejections should be reversed.

The Examiner has not properly established motivation to combine references directed to different technologies. Further, the Examiner has not properly established how these references could be combined. See, e.g., Sections 7.8.5 and 7.8.6. Instead, the Examiner relies on self-serving conclusory comments that do not satisfy the legal requirements for combining the references.

It is axiomatic that an applicant's own disclosure and claims cannot be used as though it is prior art.³⁶⁵ A basic mandate in obviousness rejections is that piecemeal reconstruction of the prior art in light of an applicant's disclosure and claims shall not be the basis for a conclusion of obviousness. See Kamm.³⁶⁶ The desirability of making modifications to come up with the claimed invention must be suggested by the prior art and not by what is taught in an applicant's own disclosure nor by what is claimed by an applicant.

Where, as here, the suggestion for the Examiner's determination that the elements and functions can be combined stems from the Appellant's own disclosure and claims and not from the applied references; the Examiner's conclusion is plain and simple hindsight and is prohibited. An artisan without knowledge of the Appellant's invention and claims would not know what elements or functions to put together, nor how to put them together, nor for what purpose.

³⁶⁵ Unless of course the relevant portion of the disclosure itself was publicly available as of the effective filing date of that application, which is not the case in the instant application.

³⁶⁶ In re Kamm, 452 F.2d 1052, 172 USPQ 298 (CCPA 1972).

When considering the instant claimed invention as a whole, the Examiner's conclusion of obviousness is clearly based upon the Appellant's disclosure and not on the references. As Judge Markey has said,

“virtually all inventions are ‘combinations’, and ... every invention is formed of ‘old elements’.... Only God works from nothing. Man must work with old elements”

See Wright.³⁶⁷ The entirety of a claimed invention, including the combinations (which must be viewed as a whole), the elements thereof, and the properties and purpose of the invention, must be considered. Id. Here, quite clearly, the Examiner has improperly relied upon the Appellant's own disclosure and not upon any notion or motivation gleaned from the references, that the claim elements can be combined in the manner set forth in the Appellant's claims, to perform the functions set forth in the Appellant's claims. See also Lindemann.³⁶⁸

An applicant's own disclosure cannot be used against him as prior art to defeat his right to a patent. The court in Nomiya³⁶⁹ stated that:

The court must be ever alert not to read obviousness into an invention on the basis of the applicant's own statements; that is, we must view the prior art without reading into that art appellant's teachings.

The test of nonobviousness is a statutory test and requires comparison of the invention as a whole with the prior art. An appellant's own disclosure cannot be used against him for purposes of obviousness.

See Kuehl.³⁷⁰

The court, in Wertheim³⁷¹ makes clear that where information to make an obviousness determination can be gleaned only from an applicant's own disclosure, it may not be used against him as prior art absent the invention being in the prior art.

³⁶⁷ In re Wright, 848 F.2d 1216, 6 USPQ2d 1959, 1962 (Fed. Cir. 1988) (emphasis and quotes in original).

³⁶⁸ See Lindemann Maschinenfabrik GmbH v. American Hoist and Derrick Co., 730 F.2d 1452, 221 USPQ 481, 488 (Fed. Cir. 1984).

³⁶⁹ In re Nomiya, 509 F.2d 566, 571, 184 USPQ 607, 612 (CCPA 1975) (quoting In re Sponnoble, 56 CCPA 823, 832-33, 405 F.2d 578, 585, 160 USPQ 237, 243 (1969)).

³⁷⁰ In re Kuehl, 475 F.2d 658, 177 USPQ 250 (CCPA 1973).

³⁷¹ In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976).

The law clearly states that the test for obviousness must be made based upon the invention as a whole to a person of ordinary skill in the art at the time the invention was made. Obviousness cannot be determined by relying upon an applicant's own disclosure of the invention.

Against this backdrop, the Examiner clearly has not met his burden of establishing a prima facie case of obviousness and, indeed, has actually established a prima facie case of patentability.

The § 103 rejections rely on improper hindsight, which is fatal to the § 103 rejections.

It is difficult but necessary that the decisionmaker forget what he or she has been taught ... about the claimed invention and cast the mind back to the time the invention was made (often as here many years), to occupy the mind of one skilled in the art who is presented only with the references, and who is normally guided by the then-accepted wisdom in the art. W.L. Gore & Associates, Inc. v. Garlock, Inc., 721 F.2d 1540, 220 USPQ 303, 313 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984).

MPEP 2141.01. The Examiner must ascertain what would have been obvious to an artisan at the time the invention was made, and not to a layman. See MPEP 2141.03. See also the Supreme Court's decision in Loom³⁷².

The references themselves must suggest the desirability and thus the obviousness of making the combination without the slightest recourse to the teachings of the application. More specifically, the court in Amgen³⁷³ stated that "Both the suggestion and the expectation of success must be founded in the prior art, not in applicant's disclosure." The court said that hindsight is not a justifiable basis on which to find obviousness.³⁷⁴ See also Heidelbergberger³⁷⁵:

When the patented invention is made by combining known components to achieve a new system, the prior art must provide a suggestion or motivation to make such a combination.

³⁷² Loom Co. v. Higgins, 105 U.S. 580 (1881).

³⁷³ Amgen, Inc. v. Chugai Pharmaceutical Co., Ltd., 927 F.2d 1200, 1207, 18 USPQ2d 1016, 1022 (Fed. Cir. 1991).

³⁷⁴ Id. at 1209, 18 USPQ2d at 1023.

³⁷⁵ Heidelberg Druckmaschinen AG v. Hantscho Commercial Products Inc., 21 F.3d 1068, 1072, 30 USPQ2d 1377, 1379 (Fed. Cir. 1994).

Obviousness is tested by what the combined teachings of the references would have suggested to an artisan. Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. The Examiner cannot rely upon improper hindsight.

“To imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to **the insidious effect of a hindsight syndrome** wherein that which only the inventor taught is used against its teacher.” ... It is essential that “the decisionmaker forget what he or she has been taught at trial about the claimed invention and cast the mind back to the time the invention was made ... to occupy the mind of one skilled in the art who is presented only with the references, and who is normally guided by the then-accepted wisdom in the art.” ... One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.

Fine.³⁷⁶

Judge Barrett in Hyatt `355³⁷⁷ clarified the requirement for motivation:

[T]hat a fact may be well known ... does not itself provide the motivation for the combination.

Judge Lee in Hyatt-`570³⁷⁸ further stated:

The appellant is correct, however, that the teachings of Fleming and Heilmeier cannot be reasonably combined in the manner depended on by the examiner to satisfy the claims. * * *

For the foregoing reasons, the rejection ... under 35 U.S.C. § 103 for obviousness over Heilmeier and Fleming is reversed.

As in Hyatt-`570, in the instant application the teachings of the references “cannot be reasonably combined in the manner depended on by the examiner to satisfy the claims.”

³⁷⁶ In re Fine, 837 F.2d 1071, 1075, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988) (quoting W.L. Gore, 721 F.2d at 1553, 220 USPQ at 312-13) (emphasis added) (citations omitted).

³⁷⁷ Ex parte Hyatt, Appeal No. 1994-3042, Paper No. 39 at 36 in patent application Serial No. 07/289,355 (PTO Bd. App. December 21, 2000) [herein Hyatt-`355] (unpublished PTO decision).

³⁷⁸ Ex parte Hyatt, Appeal No. 95-4759, Paper No. 30 at 29 and 32 in patent application Serial No. 07/357,570 (PTO Bd. App. September 25, 1996) [herein Hyatt-`570] (unpublished PTO decision).

Vice Chief Judge Harkcom in Hyatt-'061³⁷⁹ stated:

The mere fact that the prior art may be modified in the manner suggested by the examiner does not make the modification obvious under '103 unless the prior art suggested the desirability of the modification. In re Fritch, 972 F.2d 1260, 1266 n.14, 23 USPQ2d 1780, 1783-84 n.14 (Fed. Cir. 1992).

Thus, in the instant application, even if the prior art could be modified in the manner suggested by the Examiner, the modification would still not be obvious because the prior art does not suggest the desirability of the modification.

Judge Lee in Hyatt-'570³⁸⁰ further stated:

The "broadest reasonable" interpretation of the claims still has to be reasonable In short, the examiner provides no indication that the prior art provides reasonable guidance on how to piece together a multitude of separate parts to arrive at the claimed invention. * * *

For the foregoing reasons, the [§ 103] rejection ... is reversed.

As in Hyatt-'570, in the instant application "the examiner provides no indication that the prior art provides reasonable guidance on how to piece together a multitude of separate parts to arrive at the claimed invention." Thus, the § 103 rejections should be reversed.

The claimed invention cannot be used as an instruction manual or template to piece together the teachings of the prior art so that the claimed invention is rendered obvious. See Fritch.³⁸¹

Judge Hairston in Hyatt-'881³⁸² stated:

The only teaching of separate heat removal for each liquid crystal display is **appellant's teaching**, and that teaching is **not available to the examiner**. Accordingly, the 35 U.S.C. 103 rejection ... is reversed.

³⁷⁹ Ex parte Hyatt, Appeal No. 94-0665, Paper No. 28 at 15 in patent application Serial No. 07/493,061 (PTO Bd. App. June 30, 1998) [herein Hyatt-'061] (unpublished PTO decision).

³⁸⁰ Ex parte Hyatt, Appeal No. 95-4759, Paper No. 30 at 8 and 46-47 in patent application Serial No. 07/357,570 (PTO Bd. App. September 25, 1996) [herein Hyatt-'570] (unpublished PTO decision).

³⁸¹ In re Fritch, 972 F.2d 1260, 23 USPQ2d 1780 (Fed. Cir. 1992).

³⁸² Ex parte Hyatt, Appeal No. 93-2573, Paper No. 28 at 6 in patent application Serial No. 07/515,881 which issued as U.S. Patent No. 5,432,526 on July 11, 1995 (PTO Bd. App. March 24, 1994) [herein Hyatt-'881] (unpublished PTO decision) (emphasis added).

Similarly, in the instant application the Examiner relies on improper hindsight to support the § 103 rejections and, similarly, the instant § 103 rejections should be reversed.

Judge Lee in Hyatt-'570³⁸³ stated:

The "broadest reasonable" interpretation of the claims still has to be reasonable

* * *

Additionally, the teachings of Fleming and Heilmeier are not readily combinable in the manner as suggested by the examiner for a separate and independent reason In that regard, the examiner provided no explanation as to why one with ordinary skill **would have expected a reasonable certainty of success** when using Heilmeier's liquid crystal device to simulate a turning "off" of Fleming's light.

* * *

In light of the foregoing, we conclude that the examiner has not demonstrated reasonable motivation, without application of hindsight, for one with ordinary skill in the art to combine the teachings of Heilmeier and Fleming in the manner as proposed by the examiner. Even assuming that the mental twist of turning a light "off" by leaving it "on" is within the scope of common sense and rudimentary skill, it only would have been just obvious to try the suggestion proposed by the examiner without having **the required reasonable certainty of success**. "Obvious to try" without **reasonable expectation of success** is insufficient to render a claimed invention obvious under 35 U.S.C. 103. See, e.g., In re Eli Lilly & Co., 902 F.2d 943, 945, 14 USPQ2d 1741, 1743 (Fed. Cir. 1990); In re O'Farrell, 853 F.2d 894, 903, 7 USPQ2d 1673, 1681 (Fed. Cir. 1988).

Judge Lee in Hyatt-'570³⁸⁴ further stated:

Additionally, the rejection is improper for another reason. The appellant has not simply claimed using a liquid crystal device to regulate the output illumination from a source to provide a range of responses. The claimed invention is more specific. **The examiner does not**

³⁸³ Ex parte Hyatt, Appeal No. 95-4759, Paper No. 30 at 8 and 30-32 in patent application Serial No. 07/357,570 (PTO Bd. App. September 25, 1996) [herein Hyatt-'570] (unpublished PTO decision) (emphasis added).

³⁸⁴ Ex parte Hyatt, Appeal No. 95-4759, Paper No. 30 at 44-45 in patent application Serial No. 07/357,570 (PTO Bd. App. September 25, 1996) [herein Hyatt-'570] (unpublished PTO decision) (emphasis added).

adequately explain why the particular structural arrangement required by claims 71 and 81 would have been rendered obvious by Stevens and Heilmeier.

How would the liquid crystal device fit into a system such as that disclosed by Stevens? Which component would it replace? How would it be connected? How would a comparator such as that allegedly disclosed in Mengert fit into a system such as that disclosed by Stevens? Which component would it replace, if any, and why? How would it be connected? The examiner provides no answer to these questions

Without explaining how one would arrive at the particular structure required by the claims, the examiner has not made out a prima facie case that the claimed invention would have been rendered obvious by the prior art.

For these and other reasons, the Board reversed the rejection of claims 71 and 81. Hyatt-'570 at 42-47. As in Hyatt-'570, in the instant application "[t]he examiner provides no answer to these questions." Hence, the instant § 103 rejections should be reversed.

Lunsford³⁸⁵ made clear that the law on obviousness requires an evaluation of the differences between the claimed invention and the prior art. The court in Lunsford stated that it is not realistic

to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art.

Id. at 392, 148 USPQ at 726. The law is clear that in order to support a § 103 rejection, the Examiner must consider the references as a whole.

The Federal Circuit established the requirements regarding motivation and hindsight in evaluating obviousness:

To prevent the use of hindsight based on the invention to defeat patentability of the invention, this court requires the examiner to show a motivation to combine the references that create the case of obviousness. In other words, the examiner must show reasons that the skilled artisan, confronted with the same problems as the inventor and with no knowledge of the claimed invention, would select the elements

³⁸⁵ In re Lunsford, 357 F.2d 385, 148 USPQ 721 (CCPA 1966).

from the cited prior art references for combination in the manner claimed.

See Rouffet.³⁸⁶ However, the Examiner has not properly established even one of the required reasons much less all of the required reasons that an artisan (a) confronted with the same problems as the inventor, (b) with no knowledge of the claimed invention, (c) would select the elements from the cited prior art references, and (d) would combine the elements in the manner claimed. The Examiner has not properly addressed the problems confronted by the inventor nor provided proper reasons why an artisan would select and combine the components to solve such problems. In fact, the instant references provide different solutions to different problems (Section 7.8.67.8.6) and hence, if anything, show the non-obviousness of the instant claimed invention. Further, the Examiner makes the instant rejections using his knowledge of and guided by the instant disclosure and the instant claimed invention. Thus, the Examiner has failed to establish a prima facie case. The reason is clear -- the rejection is based upon improper hindsight and thus should be reversed.

The court in Rouffet went on to explain the defects in the Board's decision.

The Board did not, however, explain what specific understanding or technological principle within the knowledge of one of ordinary skill in the art would have suggested the combination. Instead, the Board merely invoked the high level of skill in the field of art. If such a rote invocation could suffice to supply a motivation to combine, the more sophisticated scientific fields would rarely, if ever, experience a patentable technical advance. Instead, in complex scientific fields, the Board could routinely identify the prior art elements in an application, invoke the lofty level of skill, and rest its case for rejection. To counter this potential weakness in the obviousness construct, the suggestion to combine requirement stands as a critical safeguard against hindsight analysis and rote application of the legal test for obviousness.

See Rouffet.³⁸⁷ In the instant application the Examiner, with full knowledge of the Appellant's invention, has selected a combination of references without properly establishing any motivation for doing so, which is the epitome of improper hindsight. This violates the Federal Circuit's "critical safeguard against hindsight analysis."

³⁸⁶ In re Rouffet, 149 F.3d 1350, 47 USPQ2d 1453, 1457-58 (Fed. Cir. 1998) (emphasis added).

³⁸⁷ In re Rouffet, 149 F.3d 1350, 47 USPQ2d 1453, 1458 (Fed. Cir. 1998) (emphasis added).

The § 103 rejections do not establish why an artisan would expect the combination of references to operate properly or to operate in the claimed manner. In the instant application, the Examiner has attempted to combine references without properly establishing motivation, details of the combination, or operability of the combination other than a vague reference that the combining of elements “would have been obvious at the time the invention.”

In view of the above, the § 103 rejections rely upon improper hindsight and hence the § 103 rejections should be reversed.

7.8.4 The Examiner Has Fallen Into “The Hindsight Trap”

In Kotzab, the Federal Circuit stated “[i]n this case, the Examiner and the Board fell into the hindsight trap”.³⁸⁸ Similarly, in the instant case the Examiner “fell into the hindsight trap”. The Examiner is guided by the Appellant’s disclosure and claims. The only motivation is obtained from the Appellant’s disclosure and claims. There is no objective evidence of obviousness.

In Gartside,³⁸⁹ the Federal Circuit stated:

We have further indicated “that the best defense against the subtle and powerful attraction of a hindsight-based obviousness analysis is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references”. [Dembiczak, 175 F.3d at 999, 50 USPQ2d at 1617]

However, in this case, the Examiner has not properly established “the teaching or motivation to combine prior art references”, much less a “rigorous application”. For example, the Examiner relied on conclusory statements regarding the combination of the references. (Section 7.8.6). The Examiner does not provide any “substantial evidence” of obviousness. See Gartside at 1780.

³⁸⁸ In re Kotzab, 55 USPQ2d 1313, 1318 (Fed. Cir. 2000) (emphasis added).

³⁸⁹ In re Gartside, 53 USPQ2d 1769, 1778 (Fed. Cir. 2000).

7.8.5 The § 103 Rejections Ignore The Requirements Of The Federal Circuit For Combining Or Modifying Of References

The Federal Circuit set forth specific requirements to combine or modify references, but the § 103 rejections ignore these requirements.

This court [the Federal Circuit] has identified three possible sources for a motivation to combine references: **the nature of the problem to be solved, the teachings of the prior art, and the knowledge of persons of ordinary skill in the art**. In this case, the Board relied upon none of these. Rather, just as it relied on the high level of skill in the art to overcome the differences between the claimed invention and the selected elements in the references, it relied upon the high level of skill in the art to provide the necessary motivation. The Board did not, however, explain **what specific understanding or technological principle within the knowledge of one of ordinary skill in the art would have suggested the combination**. Instead, the Board merely invoked the high level of skill in the field of art. If such a rote invocation could suffice to supply a motivation to combine, the more sophisticated scientific fields would rarely, if ever, experience a patentable technical advance. Instead, in complex scientific fields, the Board could routinely identify the prior art elements in an application, invoke the lofty level of skill, and rest its case for rejection. To counter this potential weakness in the obviousness construct, the suggestion to combine requirement stands as a critical safeguard against hindsight analysis and rote application of the legal test for obviousness.

Rouffet.³⁹⁰ The Examiner, however, neither explained (a) “the nature of the problem to be solved,” nor (b) “the teachings of the prior art,” nor (c) “the knowledge of persons of ordinary skill in the art”, nor (d) “what specific understanding or technological principle within the knowledge of one of ordinary skill in the art would have suggested the combination”. Ignoring this explicit Federal Circuit guidance is fatal to § 103 rejections which rely on a combination of references. See also Sections 7.8.5 and 7.8.6 regarding improper combining of references. The Examiner’s disregard for these Federal Circuit requirements is fatal to the § 103 rejections which rely on a combination of references.

The court in In re Kotzab, 55 USPQ2d 1313, 1316-17 (Fed. Cir. 2000) stated:

³⁹⁰ In re Rouffet, 149 F.3d 1350, 47 USPQ2d 1453, 1458 (Fed. Cir. 1998) (emphasis added).

Even when obviousness is based on a single prior art reference, there must be a showing of a suggestion or motivation to modify the teachings of that reference. *See B.F. Goodrich Co. v. Aircraft Breaking Sys. Corp.*, 72 F.3d 1577, 1582, 37 USPQ2d 1314, 1318 (Fed. Cir. 1996).

The § 103 rejections do not properly address the nature of the references nor the combinations of the references. For example, the rejections do not establish why such references are pertinent to the instant claimed invention. Further, the references are directed to different types of systems with different types of implementations therebetween where the manner of making the combinations is not obvious. Merely finding disconnected bits-and-pieces in the prior art is insufficient.

The Examiner has not properly established how such diverse references can be combined:

When the patented invention is made by combining known components to achieve a new system, the prior art must provide a suggestion or motivation to make such a combination.

Heidelberger.³⁹¹

In an appeal in application Hyatt '355,³⁹² Judge Barrett clarified the requirement for motivation:

[T]hat a fact may be well known ... does not itself provide the motivation for the combination.

As in the instant case, the examiner in Hyatt-'355 relied on improper hindsight to support § 103 rejections. Thus, the Board reversed all of the § 103 rejections in Hyatt-'355:

The examiner fails to show a suggestion of the limitations in the prior art. "Obviousness may not be suggested using hindsight or in view of the teachings or suggestions of the inventor." Para-Ordnance Mfg. v. SGS Importers Int'l, 73 F.3d 1085, 1087, 37 USPQ2d 1237, 1239 (Fed. Cir. 1995) (citing W.L. Gore & Assocs., Inc. v. Garlock, Inc., 721 F.2d 1540, 1551, 1553, 220 USPQ 303, 311, 312-13 (Fed. Cir. 1983)). "It is impermissible to use the claimed invention as an instruction manual or 'template' to piece together the teachings of the prior art so that the claimed invention is rendered obvious." In re Fritch, 972 F.2d

³⁹¹ Heidelberger Druckmaschinen AG v. Hantscho Commercial Products Inc., 21 F.3d 1068, 1072, 30 USPQ2d 1377, 1379 (Fed. Cir. 1994); *see also* Amgen, Inc. v. Chugai Pharmaceutical Co., Ltd., 927 F.2d 1200, 18 USPQ2d 1016 (Fed. Cir. 1991).

³⁹² Ex parte Hyatt, Appeal No. 1994-3042, Paper No. 39 at 36 in patent application Serial No. 07/289,355 (PTO Bd. App. December 21, 2000) [herein Hyatt-'355] (unpublished PTO decision).

1260, 1266, 23 USPQ2d 1780, 1784 (Fed. Cir. 1992) (citing In re Gorman, 933 F.2d 982, 987, 18 USPQ2d 1885, 1888 (Fed. Cir. 1991)). “[T]he question is whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination.” In re Beattie, 974 F.2d 1309, 1311-12, 24 USPQ2d 1040, 1042 (Fed. Cir. 1992) (quoting Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co., 730 F.2d 1452, 1462, 221 USPQ 481, 488 (Fed. Cir. 1984)).

* * *

Although Hobrough teaches “automatic registration of photographic images,” col. 3, ll. 49-50, the examiner fails to identify a sufficient suggestion to add the automatic registration of Hobrough to the system of Hemstreet. There is no evidence that the sample and the patterns to be compared in Hemstreet are misregistered so as to benefit from registration.

* * *

... the examiner fails to allege, let alone show, that the reference cures the deficiency of Hemstreet and Hobrough.

Hyatt-’355 at 27-29.

The Federal Circuit requires that the Examiner provide motivation or a suggestion from the prior art to support a combining of references (e.g., Section 7.8.5). However, the Examiner disregarded this requirement and relied on erroneous conclusory statements to attempt to combine the references, which is improper (e.g., Section 7.2.3).

Furthermore, the Board in Levengood³⁹³ made clear that some objective reason to combine the teachings of the references is necessary. Merely alleging that the modification would have been obvious is not sufficient to establish a prima facie case. See MPEP 2143.01. The instant § 103 rejections therefore fail to establish a prima facie case of obviousness.

If the Examiner had addressed these Federal Circuit requirements, he would have found that the references which he sought to combine address different problems therebetween, that the references sought to be combined address different problems than the problem addressed by the instant claimed

³⁹³ Ex parte Levengood, 28 USPQ2d 1300, 1302 (Bd. Pat. App. & Int. 1993).

invention, that the references do not suggest the combination, and that neither the teachings of the prior art nor the knowledge of persons of ordinary skill in the art would have motivated the combination.

The court in Ecolochem stated that:

When a rejection depends on a combination of prior art references, there must be some teaching, suggestion, or motivation to combine the references.

See Ecolochem.³⁹⁴ The court went on to recognize that:

[T]he district court used the '411 patent as a blueprint and looked to other prior art for the elements present in the patent but missing from the Houghton process. The district court opinion does not discuss any specific evidence of motivation to combine, but only makes conclusory statements. 'Broad conclusory statements regarding the teaching of multiple references, standing alone, are not evidence'.

Id. at 1073. In discussing a multiple reference rejection, the court in Dembiczak stated:

To the contrary, the obviousness analysis in the Board's decision is limited to a discussion of the ways that the multiple prior art references can be combined to read on the claimed invention Yet, this reference-by-reference, limitation-by-limitation analysis fails to demonstrate how the references teach or suggest their combination with the conventional trash or lawn bags to yield the claimed invention Because we do not discern any finding by the Board that there was a suggestion, teaching, or motivation to combine the prior art references cited against the pending claims, the Board's conclusion of obviousness, as a matter of law, cannot stand.

See Dembiczak.³⁹⁵

Commenting upon an obviousness rejection, the court in Hybritech stated that:

The large number of references, as a whole, relied upon by the district court to show obviousness, about twenty in number, skirt all around but do not as a whole suggest the claimed invention, which they must, to overcome the presumed validity Focusing on the obviousness of substitutions and differences instead of on the invention as a whole, as the district court did in frequently describing the claimed invention as the mere substitution of monoclonal for polyclonal

³⁹⁴ Ecolochem v. Southern California Edison, 56 USPQ2d 1065, 1073 (Fed. Cir. 2000).

³⁹⁵ In re Dembiczak, 50 USPQ2d 1614, 1618 (Fed. Cir. 1999).

antibodies in a sandwich assay, was a legally improper way to simplify the difficult determination of obviousness.

See Hybritech³⁹⁶

Further, the Board in Levengood³⁹⁷ made clear that some objective reason to combine the teachings of the references is necessary. The mere statement that the modification would have been within the skill of the art is not sufficient to establish a prima facie case. See MPEP 2143.01. The instant obviousness rejections therefore fail to establish a prima facie case of obviousness.

The Examiner has not properly established motivation to combine the references. Hence, the obviousness rejections based upon combinations of references should be reversed.

7.8.6 The Examiner Has Not Properly Established That An Artisan Would Be Motivated To Combine Or Modify The References

The rejections do not properly establish that an artisan would be motivated to combine or modify the references. This is not surprising, these references were selected by the Examiner who was guided by the instant claims and the instant disclosure in hindsight, which is improper (Sections 7.8.3 and 7.8.4). The combinations of references are listed below.

The Examiner continually repeats his mantra that “It would have been obvious” without providing adequate supporting evidence.

The Federal Circuit stated:³⁹⁸

Even when obviousness is based on a single prior art reference, there must be a showing of a suggestion or motivation to modify the teachings of that reference. *See B.F. Goodrich Co. v. Aircraft Breaking Sys. Corp.*, 72 F.3d 1577, 1582, 37 USPQ2d 1314, 1318 (Fed. Cir. 1996).

However, the Examiner has disregarded this requirement. Thus, the § 103 rejections should be reversed.

³⁹⁶ Hybritech Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 231 USPQ 81, 93 (Fed. Cir. 1986).

³⁹⁷ Ex parte Levengood, 28 USPQ2d 1300, 1301 (Bd. Pat. App. & Int. 1993).

³⁹⁸ In re Kotzab, 55 USPQ2d 1313, 1316-17 (Fed. Cir. 2000).

The Examiner makes up self-serving statements regarding combinability, but this is contrary to the law. The motivation must be found in the prior art; however, the Examiner does not cite to any particular statements in the prior art for support. To the contrary, the Examiner relies on self-serving conclusory statements (e.g; instant Action at 146, 149, 154, and 165 ; respectively).

7.8.7 The Examiner Makes Unreasonable Claim Readings, Apparently Relying On His Failure To Properly Construe The Rejected Claims

The Examiner makes unreasonable claim readings as a result of his failure to properly construe the rejected claims (Section 7.2.6; see also Sections 7.3.5.1 and 7.6.4). The Examiner cannot indiscriminately read anything in the claims on anything in the references just because he failed to properly construe the rejected claims (Sections 7.3.5.1, 7.2.6, and 7.6.4) and failed to perform the required Gechter, Rouffet, and Graham analyses (Section 7.8.8).

Implicit in our review of the Board's anticipation analysis is that the claim must first have been correctly construed to define the scope and meaning of each contested limitation.

Gechter at 1032 (emphasis added):

Similarly, if the claims were misconstrued, a finding of anticipation must be reversed unless the error was harmless.

* * *

[I]n *Graco, Inc. v. Binks Manufacturing Co.*, 60 F.3d 785, 35 USPQ2d 1255 (Fed. Cir. 1995), we vacated the district court's judgment of patent infringement, because the district court's opinion was "absolutely devoid of any discussion of claim construction."

Gechter at 1033.

In the present case, the Board's opinion lacks a claim construction, makes conclusory findings relating to anticipation, and omits any analysis on several limitations.

* * *

In sum, we hold that the Board is required to set forth in its opinions specific findings of fact and conclusions of law adequate to form a basis for our review. In particular, we expect that the Board's anticipation analysis be conducted on a limitation by limitation basis, with specific fact findings for each contested limitation and satisfactory explanations for such findings. Claim construction must also be explicit, at least as to any construction disputed by parties to the interference (or an applicant or patentee in an ex parte proceeding).

Gechter at 1035.

This methodology of indiscriminately reading anything on anything else is fatal to the § 103 rejection.

7.8.8 The § 103 Rejections Do Not Perform The Required Graham, Rouffet, And Gechter Analyses

The starting point of any § 103 obviousness analysis is the Supreme Court's decision in Graham v. Deere.³⁹⁹ The Supreme Court in Graham focused on the procedural steps necessary to establish a factual basis for a rejection under § 103 and held that an examiner must evaluate (1) the scope and content of the prior art, (2) the differences between the prior art and the claims at issue, and (3) the level of ordinary skill in the art. Secondary considerations such as commercial success, long felt but unsolved need, failure of others, etc. may have relevancy as indicia of obviousness or nonobviousness. The instant § 103 rejections, however, fail to provide any of this required Graham analysis.

Gechter articulates the law on claim construction. In Gechter,⁴⁰⁰ the Federal Circuit stated that it expects an obviousness analysis to be conducted on a limitation-by-limitation basis with specific fact findings for each contested claim limitation and claim construction must be explicit (Section 7.6.2). However, the § 103 rejections do not properly provide this required Gechter analysis. The Examiner has failed to properly construe the rejected claims (Sections 7.3.5.1, 7.2.6, and 7.6.4). Because the

³⁹⁹ Graham v. Deere, 383 U.S. 1, 148 USPQ 459 (1966).

⁴⁰⁰ Gechter v. Davidson, 116 F.3d 1454, 43 USPQ2d 1030 (Fed. Cir. 1997).

Examiner has not properly construed the rejected claims, the attempted readings of the claims on the references is a hollow exercise. For this additional reason, the § 103 rejections should be reversed.

The court in In re Kotzab, 55 USPQ2d 1313, 1316-17 (Fed. Cir. 2000) stated:

Even when obviousness is based on a single prior art reference, there must be a showing of a suggestion or motivation to modify the teachings of that reference. *See B.F. Goodrich Co. v. Aircraft Breaking Sys. Corp.*, 72 F.3d 1577, 1582, 37 USPQ2d 1314, 1318 (Fed. Cir. 1996).

The Board in Horton⁴⁰¹ reflected the position now clarified by the Federal Circuit in Gechter. In Horton, the Board found that the analysis performed by the examiner was insufficient to make out a case for obviousness:

We find that Horton has failed to present an appropriate analysis of the prior art reference vis-a-vis the claimed subject matter which would be sufficient to make out a case for anticipation or obviousness. There is little explanation in the Horton brief to provide adequate factual support for the conclusory statements set forth therein. If Horton considered the subject matter of any Stevens claim to have been anticipated or rendered obvious by Levendusky, he should have analyzed the reference in detail in accordance with the guidelines set forth in Graham v. John Deere Co. Specifically, he should have separately addressed each claim limitation in explaining where in the reference relevant subject matter is disclosed, what the differences are, and why the claimed invention as a whole would have been obvious to a person having ordinary skill in the art. Horton did not do this.

Id. at 1246. The Board went on to list the limitations which were not separately addressed. The Board stated that the proponent of unpatentability has the burden of establishing that the claims are either anticipated or rendered obvious and emphasized the necessity to employ the factual inquiries set forth in Graham.

The Examiner's failure to make a Graham analysis is fatal to the § 103 rejections.

In patent cases, the need for express Graham findings takes on an especially significant role because of an occasional tendency of district courts to depart from the Graham test, and from the statutory standard

⁴⁰¹ Horton v. Stevens, 7 USPQ2d 1245 (Bd. Pat. App. & Int. 1988).

of unobviousness that it helps determine, to the tempting but forbidden zone of hindsight.

Loctite.⁴⁰² The court in Loctite stressed the importance of Graham findings in order to evaluate the question of obviousness/nonobviousness. Here, the § 103 rejections should be reversed because there is an insufficient factual basis upon which to reach a conclusion of obviousness. A failure by the Examiner to make specific Graham findings is proper grounds for reversing the instant § 103 rejections.

The court in Loctite commented that although Graham was cited in the rejection, because its guidance was not properly applied, the result was the application of hindsight and speculation, both of which are prohibited by law. Here, the Examiner did not even mention Graham much less attempt to apply Graham.

Rouffet articulates the law on motivation to combine references. In Rouffet, the Federal Circuit stated:

To prevent the use of hindsight based on the invention to defeat patentability of the invention, this court requires the examiner to show a motivation to combine the references that create the case of obviousness. In other words, the examiner must show reasons that the skilled artisan, confronted with the same problems as the inventor and with no knowledge of the claimed invention, would select the elements from the cited prior art references for combination in the manner claimed.

Rouffet.⁴⁰³ However, the Examiner has never even addressed and certainly has never shown even one of the required reasons much less all of the required reasons that an artisan (a) confronted with the same problems as the inventor, (b) with no knowledge of the claimed invention, (c) would select the elements from the cited prior art references, and (d) would combine the elements in the manner claimed. He has never addressed the problems confronted by the inventor nor provided proper reasons why an artisan would select and combine the components to solve such problems. In fact, the references provide different solutions to different problems (Section 7.8.6) and hence, if anything, show the non-obviousness of the instant claimed invention. Further, the Examiner makes the instant rejections using

⁴⁰² Loctite Corp. v. Ultraseal Ltd., 781 F.2d 861, 873, 228 USPQ 90, 98 (Fed. Cir. 1985)

⁴⁰³ In re Rouffet, 149 F.3d 1350, 47 USPQ2d 1453, 1457-58 (Fed. Cir. 1998) (emphasis added).

his knowledge of and guided by the instant disclosure and the instant claimed invention. Thus, the Examiner has not provided the proper Rouffet analysis on any of the claims, and § 103 rejections, being based upon improper hindsight, should be reversed.

There are significant differences between the limitations of the claims and the features that the Examiner relies on in the references. Hence, for this reason alone, such analyses are essential to the § 103 rejection. Despite these compelling reasons, the Examiner has failed to provide even a single one of these Gechter, Rouffet, and Graham analyses. For this additional reason of unreconciled differences between the claims and the references, the § 103 rejections should be reversed.

The Examiner's failure to perform either a Gechter, a Rouffet, or a Graham analysis is not surprising since any one of these analyses would have established the non-obviousness of the instant claims over the references. The Examiner's failure to perform these analyses violates the law of the U.S. Supreme Court, the law of the Federal Circuit, and the rules of the PTO and is fatal to the § 103 rejections. In view of the above, the Examiner has not provided a Graham, a Gechter, or a Rouffet analysis in support of the § 103 rejections. This is not surprising because a Graham, a Gechter, or a Rouffet analysis would have shown that the claims are not obvious over the references and the Examiner would not have been able to persist in the § 103 rejections. Hence, the § 103 rejections should be reversed.

The instant obviousness rejections do not establish in what manner an artisan would combine the elements in the references. In order to establish obviousness, there must be a showing of a suggestion or motivation to modify the teachings of the references in order to arrive at the claimed invention.⁴⁰⁴ See Section 7.8.9.

It is well established that most inventions are combinations of old elements. Thus, a reference or combination of references that render obvious each of the elements of a claim or claims is insufficient standing alone to establish a prima facie case of obviousness. There must be a finding as to the specific understanding or principle within the knowledge of a skilled artisan that would have motivated one with no knowledge of the applicant's invention to make the specific combination that was made by the applicant. See Kotzab above.

⁴⁰⁴ See In re Kotzab, 217 F.3d 1365, 55 USPQ2d 1313 (Fed. Cir. 2000).

The court in Dembiczak⁴⁰⁵ commented that the:

... reference-by-reference, limitation-by-limitation analysis fails to demonstrate how the Holiday and Shapiro references teach or suggest their combination with the conventional trash or lawn bags to yield the claimed invention.

The court stated that since they could discern no finding by the Board that there was a suggestion, teaching, or motivation to combine the prior art references cited against the claims, the Board's conclusion of obviousness, as a matter of law, could not stand.

As the court stated in Kotzab.⁴⁰⁶

[A] rejection cannot be predicated on the mere identification in Evans of individual components of claimed limitations. Rather, particular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination *in the manner claimed*.

Thus, there can be no prima facie case of obviousness without a showing of a suggestion or motivation to combine the references *in the manner claimed*.

The obviousness rejections do not establish why an artisan would expect the combination of references to operate properly or to operate in the claimed manner.

Judge Newman stated:

When the patented invention is made by combining known components to achieve a new system, the prior art must provide a suggestion or motivation to make such a combination.... In re Geiger, 815 F.2d 686, 688, 2 USPQ2d 1276, 1278 (Fed. Cir. 1987) (obviousness can not be established by combining pieces of prior art absent some "teaching, suggestion, or incentive supporting the combination"). There is nothing in the prior art to lead a person of ordinary skill to the combination of the structures shown in these references ... other than the hindsight knowledge of Mueller's construction The motivation to combine referernces can not come from the invention itself.

See Heidelberg.⁴⁰⁷

⁴⁰⁵ In re Dembiczak, 175 F.3d 994, 50 USPQ2d 1614, 1618 (Fed. Cir. 1999).

⁴⁰⁶ In re Kotzab, 217 F.3d 1365, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000).

In Fritch, the Federal Circuit held:

The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification.... It is impermissible to use the claimed invention as an instruction manual.... of 'template' to piece together the teachings of the prior art so that the claimed invention is rendered obvious.

See Fritch.⁴⁰⁸ Thus, the instant obviousness rejections fail to establish a prima facie -- they do not show why an artisan would, at the time the invention was made, interconnect the elements as they are interconnected in the claims and have the elements acting in response to other acts or steps as set forth in the claims and, after doing so, having the resulting system operate in the claimed manner. There is no objective evidence supporting the position of the Examiner, only prohibited hindsight.

In view of the above, the obviousness rejections rely upon improper hindsight. Hence, the obviousness rejections should be reversed.

7.8.9 Traverse Of The Examiner's Statements Regarding The § 103 Rejections

7.8.9.1 The § 103 rejection over Jain and Tiemann

The Examiner states (instant Action at 144):

18. Claims 244, 245, 262, and 381 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jain et al., Displacement Measurement and Its Application in Interframe Image Coding, as applied to claims above, and further in view of Tiemann, 4,375,650.

Jain provides for communicating output image information over a communication link in response to the transformed image information in at least the first full paragraph in the Introduction on page 1799, which can very likely include an RF link, and further with explicit reference to a transmission link in Fig. 6b and "transmit" in Fig. 9. Jain does not explicitly provide for the communication link being RF. Tiemann is in the same environment of video compression (first full paragraph in c. 1 and c. 1, lines 40-44), and further teaches the

⁴⁰⁷ Heidelberger Druckmaschinen v. Hantscho Commercial Products, 21 F.3d 1068, 30 USPQ2d 1377 (Fed. Cir. 1994).

⁴⁰⁸ In re Fritch, 972 F.2d 1260, 23 USPQ2d 1780, 1783-784 (Fed. Cir. 1992).

conventionality of using an RF link in c. 11, lines 50-55, which explicitly uses a "radio frequency relay for transmission to a receiving station", i.e. RF — radio frequency. Jain can clearly use an RF link, as taught by Tiemann, to communicate to the decoder/receiver, since Jain already discloses a television video signal which can be transmitted over a transmission link. It would've been obvious to one having ordinary skill in the art at the time the invention was made to use an RF link to transmit the compressed video of Jain, since an RF communication link provides for at least the advantages of wireless communication, because RF can provide for either or both of a wide coverage area as well as long range distance depending on the transmitter, and also because Tiemann also recites that such a communication link is "appropriate".

However, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for this reason alone, the instant rejection fails to establish a *prima facie* case.

Further, the rejection is based upon references that are directed to different technologies.

a) Jain is directed to "displacement measurement and its application in interframe image coding"; and

b) Tiemann is directed to a video block system.

However, the Examiner does not provide a proper showing of motivation for the combination thereof nor provide a proper showing of how these references could have been combined (Sections 7.8.5, 7.8.6, and 7.8.8). Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection does not establish a proper teaching or suggestion in the prior art suitable to combine the references. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 244, 245, and 381; respectively:

244. A process comprising the acts of:
 storing a prior 64-pixel block of pixel image information;
 storing a next 64-pixel block of pixel image information; and
 generating a temporally interpolated 64-pixel block of image information by temporally interpolating between the prior 64-pixel block of pixel image information and the next 64-pixel block of pixel image information.

245. A process as set forth in claim 244, further comprising the act of:

communicating output image information over an RF data link in response to the temporally interpolated 64-pixel block of image information.

381. A system comprising:
 memory means for storing a prior 64-pixel block of image information;
 memory means for storing a next 64-pixel block of image information; and
 means for generating a plurality of temporally interpolated 64-pixel blocks of image information between the prior 64-pixel block of image information and the next 64-pixel block of image information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the "in response to" claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

The Examiner states (instant Action at 144-145):

Jain provides for blocks of, inter alia, 16 x 16 in the first paragraph in section III on page 1801. Jain is probably not restricted to such an example, since Jain also teaches block sizes in general, i.e. M x N in the first full paragraph on page 1800. Tiemann provides for using an 8 x 8 block of pixels in at least the first full paragraph in c. 4 and as shown in Fig. 2. Jain can clearly use 8x8 blocks instead of 16 x 16 blocks, and it is also clear that Tiemann and Jain are in the same environment of video compression (first full paragraph in c. 1 and c. 1, lines 40-44, of Tiemann). It would've been obvious to one having ordinary skill in the art at the time the invention was made to use 8x8 blocks with the video data compression system of Jain, since 8 x 8 blocks as suggested by Jain, would reduce complexity and would be faster, and because Tiemann uses the 8 x 8 blocks in conjunction with transformation, which "greatly simplifies the calculation" as noted in c. 5, lines 57-58.

However, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for this reason alone, the instant rejection fails to establish a *prima facie* case.

Further, the rejection is based upon references that are directed to different technologies.

a) Jain is directed to "displacement measurement and its application in interframe image coding"; and

b) Tiemann is directed to a video block system.

However, the Examiner does not provide a proper showing of motivation for the combination thereof nor provide a proper showing of how these references could have been combined (e.g.; Sections 7.8.5, 7.8.6, and 7.8.8). Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection does not establish a proper teaching or suggestion in the prior art suitable to combine the references. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 244, 245, and 381; respectively:

244. A process comprising the acts of:
 storing a prior 64-pixel block of pixel image information;
 storing a next 64-pixel block of pixel image information; and
 generating a temporally interpolated 64-pixel block of image information by temporally interpolating between the prior 64-pixel block of pixel image information and the next 64-pixel block of pixel image information.

245. A process as set forth in claim 244, further comprising the act of:
 communicating output image information over an RF data link in response to the temporally interpolated 64-pixel block of image information.

381. A system comprising:
 memory means for storing a prior 64-pixel block of image information;
 memory means for storing a next 64-pixel block of image information; and
 means for generating a plurality of temporally interpolated 64-pixel blocks of image information between the prior 64-pixel block of image information and the next 64-pixel block of image information.

For example, the Examiner apparently has not given weight to various claim limitations (Table 5.1) nor to the “in response to” claim limitations (Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

7.8.9.2 The § 103 rejection over Sacks and Pincoffs

The Examiner states (instant Action at 145-146):

19. Claim 143 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Sacks et al. (US 4,736,437 A) and Pincoffs et al. (US 3,638,188 A).

Notes:

- Intended use limitations in the body of the claim are not given weight.
- The details of Sacks as described above are incorporated herein by reference, and will not be repeated here.

While Sacks discloses the comparison of a video image with a reference images as described above, Sacks does not teach the input and comparison of an IR or an Radar image with that of a corresponding reference.

Pincoffs discloses a pattern recognition system ("pattern recognition" at column 1, line 8) comprising comparing an input image with a reference image ("observed features are compared with a reference" at column 3, line 29), comprising inputting and comparing not only optical images, but also IR and Radar images ("infrared sensors" and "radar" at column 9, lines 69-70).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to adapt Sacks to not only input and compare images, but also IR and radar images as taught Pincoffs, thereby expanding the capabilities of Sacks by allowing the "image under observation [to be] compiled from a plurality of sources ... of multispectral character" (Pincoffs, column 9, line 64).

However, the Examiner has not specifically identified which part of Sacks is relied upon (Section 7.6.6). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the rejection is based upon references that are directed to different technologies.

- a) Sacks is directed to pattern recognition; and
- b) Pincoffs is directed to classification for pattern recognition systems.

However, the Examiner does not provide a proper showing of motivation for the combination thereof nor provide a proper showing of how these references could have been combined (e.g.; Sections 7.8.5, 7.8.6, and 7.8.8). Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection does not establish a proper teaching or suggestion in the prior art suitable to combine the references. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 143:

143. A process comprising the acts of:
 storing computer instructions;
 generating infra-red image information; and
 generating pattern recognition information in response to the
 infra-red image information and in response to the computer
 instructions.

For example, the Examiner admits to not giving any weight to so-called “intended use [claim] limitations” (*see, e.g.*; Table 5.1) and the Examiner has apparently not given weight to “in response to” claim limitations (*see, e.g.*; Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (*e.g.*; Section 7.6.5).

7.8.9.3 The § 103 rejection over Fant and Maguer

The Examiner states (instant Action at 146-147):

20. Claims 116, 131, 149, 166, 226 and 301, as well as their corresponding dependent claims, are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Fant (US 4,835,532 A) and Maguer et al. (US 3,967,233 A).

Notes:

- Intended use limitations in the body of the claim are not given weight.
- The details of Fant as described above are incorporated herein by reference, and will not be repeated here.

Fant teaches that a variety of sensors can be used to capture and stored the database images ("based on sensed IR, MMW, radar, etc." at column 6, line 52). Fant does not limit the domain in which the images are captured ("If a group be working in a certain domain—IR, visual, millimeter wave, or radar, imagery from that sensor is loaded in the object file" at column 13, line 11).

Fant does not teach "sonar" or "ultra-sound" as sensor information.

Maguer discloses capturing images of surfaces and objects using a sonar system ("recognize the shape of the ocean bottom or ... an

object on the bottom or floating near the bottom" at column 1, line 13; "sonar ... furnish an image on a screen ... sufficient to permit identification of the object" at column 1, lines 61-65). The sonar emits and receives ultra-sound information (figure 1, numerals 3 and 4; "very short, periodic acoustic pulses" at column 1, line 68; "420KHz" at column 3, line 36).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize sonar/ultra-sound sensors as taught by Maguer, in order to capture images of objects and surfaces for storage and subsequent use by the simulation system of Fant. One would be motivated to add the sonar/ultra-sound sensor and image information of Maguer to the input sensors and database of Fant because of its "precise resolving power" (Maguer, column 1, line 63) and ability to provide images with "clarity, definition and contrast sufficient to permit identification of [an] object" (Maguer, column 1, line 64), thereby providing high quality image for Fant's simulations. Further, this modification would also allow Fant's system to simulate other vehicles, such as ships, deep sea diving apparatus and/or submarines which would have been obvious to one skilled in the art because all types of vehicles need simulation for training purposes.

However, the Examiner has not specifically identified which part of Fant is relied upon (Section 7.6.6). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the rejection is based upon references that are directed to different technologies.

- a) Fant is directed to a spatial transform image processing system; and
- b) Maguer is directed to a sonar system for classifying submerged objects.

However, the Examiner does not provide a proper showing of motivation for the combination thereof nor provide a proper showing of how these references could have been combined (e.g.; Sections 7.8.5, 7.8.6, and 7.8.8). Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection does not establish a proper teaching or suggestion in the prior art suitable to combine the references. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 131, 166, and 301; respectively:

131. A process comprising the acts of:
 storing computer instructions;
 generating sonar image information; and
 generating kernel filtered image information in response to the
 sonar image information and in response to the computer instructions.

166. A process comprising the acts of:
 storing computer instructions;
 generating sonar image information; and
 generating zoomed image information in response to the sonar
 image information and in response to the computer instructions.

301. A process comprising the acts of: storing computer
 instructions;
 generating sonar image information; and
 generating translated rotated image information in response to
 the sonar image information and in response to the computer
 instructions.

For example, the Examiner admits to not giving any weight to so-called “intended use [claim] limitations” (*see, e.g.*; Table 5.1) and the Examiner has apparently not given weight to “in response to” claim limitations (*see, e.g.*; Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (*e.g.*; Section 7.6.5).

7.8.9.4 The § 103 rejection over Fant, Maguer, and Cleminson

The Examiner states (instant Action at 148-151):

21. Claim 167, as well as its corresponding dependent claims, are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Fant (US 4,835,532 A) and Maguer et al. (US 3,967,233 A) and Cleminson (US 4,675,829 A).

Notes:

- Intended use limitations in the body of the claim are not given weight.
- The details of Fant as described above are incorporated herein by reference, and will not be repeated here.

Fant teaches that a variety of sensors can be used to capture and stored the database images (“based on sensed IR, MMW, radar, etc.” at column 6, line 52). Fant does not limit the domain in which the images are captured (“If a group be working in a certain domain—IR,

visual, millimeter wave, or radar, imagery from that sensor is loaded in the object file" at column 13, line 11).

Fant does not teach "sonar" or "ultra-sound" as sensor information. Maguer discloses capturing images of surfaces and objects using a sonar system ("recognize the shape of the ocean bottom or ... an object on the bottom or floating near the bottom" at column 1, line 13; "sonar ... furnish an image on a screen ... sufficient to permit identification of the object" at column 1, lines 61-65). The sonar emits and receives ultra-sound information (figure 1, numerals 3 and 4; "very short, periodic acoustic pulses" at column 1, line 68; "420KHz" at column 3, line 36).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize sonar/ultra-sound sensors as taught by Maguer, in order to capture images of objects and surfaces for storage and subsequent use by the simulation system of Fant. One would be motivated to add the sonar/ultra-sound sensor and image information of Maguer to the input sensors and database of Fant because of its "precise resolving power" (Maguer, column 1, line 63) and ability to provide images with "clarity, definition and contrast sufficient to permit identification of [an] object" (Maguer, column 1, line 64), thereby providing high quality image for Fant's simulations. Further, this modification would also allow Fant's system to simulate other vehicles, such as ships, deep sea diving apparatus and/or submarines which would have been obvious to one skilled in the art because all types of vehicles need simulation for training purposes.

The various modules (e.g., figure 3) of the Fant system each make artificial intelligence type decisions as described above, thus adhering to the construction of the term "artificial intelligence" as applied by the examiner. However, these processing blocks do not adhere to a more rigorous definition of "artificial intelligence" (not relied upon by the examiner) in the art. However, even if Fant does not meet a more rigorous definition, the use of artificial intelligence would have been obvious at the time the invention was made as follows.

Cleminson states, at column 1, lines 10-34:

"Artificial intelligence (AI) technology is a discipline with an ultimate goal of providing a machine that is capable of reasoning, making inferences and following rules in a manner believed to model the human mind. A great deal of theoretical work has been done in this discipline, and much remains to be done. Artificial intelligence theory is beginning to find applications because of the hope that its principles can be effectively applied to develop better computer software and to provide to relatively untrained users sophisticated computer power to solve practical problems such as to assist in the analysis of massive

amounts of relatively unprocessed data to aid in decision-making processes.

As AI technology begins to demonstrate potential and practical uses, tools are needed to speed development of practical computational systems. AI specialists have developed a number of AI-dedicated computer languages to assist in this development. Among the languages are LISP and PROLOG. However, these languages are not particularly easy for either skilled AI researchers or minimally-trained user/programmers to use to develop sophisticated and complex knowledge bases necessary to solve the problems related to artificial intelligence applications. Hence, tools are needed which are better suited to the requirements of both a minimally-trained knowledge base user and a skilled AI researcher."

It would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the artificial intelligence processing as described by Cleminson above, either in the software and/or hardware of Fant's various processing modules (e.g., figure 3), in order to:

provide "a machine that is capable of reasoning, making inferences and following rules in a manner believed to model the human mind", and

"to develop better computer software and to provide to relatively untrained users sophisticated computer power to solve practical problems such as to assist in the analysis of massive amounts of relatively unprocessed data to aid in decision-making processes",

Thereby improving the speed and accuracy with which Fant's processing modules make their respective decisions.

However, the Examiner has not specifically identified which part of Fant is relied upon (Section 7.6.6).

Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the rejection is based upon references that are directed to different technologies.

- a) Fant is directed to a spatial transform image processing system;
- b) Maguer is directed to a sonar system for classifying submerged objects; and
- c) Cleminson is directed to knowledge-based systems.

However, the Examiner does not provide a proper showing of motivation for the combination thereof nor provide a proper showing of how these references could have been combined (e.g.; Sections 7.8.5, 7.8.6, and 7.8.8). Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection does not establish a proper teaching or suggestion in the prior art suitable to combine the references. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 167:

167. A process comprising the acts of:
 storing computer instructions;
 generating sonar image information; and
 generating artificial intelligence information in response to the
 sonar image information and in response to the computer instructions.

For example, the Examiner admits to not giving any weight to so-called “intended use [claim] limitations” (*see, e.g.*; Table 5.1) and the Examiner has apparently not given weight to “in response to” claim limitations (*see, e.g.*; Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

7.8.9.5 The § 103 rejection over Fant and Tescher

The Examiner states (instant Action at 151-152):

22. Claims 120, 207, 232, 381 and 571, as well as their corresponding dependent claims, are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Fant (US 4,835,532 A) and Tescher (US 4,541,012 A).

Notes:

- Intended use limitations in the body of the claim are not given weight.
- The details of Fant as described above are incorporated herein by reference, and will not be repeated here.

While Fant discloses the storage and processing of digital images (“digital disk ... 12-bit data” at column 9, line 13), Fant does not teach processing the images as 8 X 8 or 64-pixel blocks of image information.

Tescher discloses an image processing system comprising dividing the images into eight by eight pixel blocks, or stated another

way, into 64-pixel blocks ("In the preferred embodiment, the method is optimized by employing a total of 64 pixels per block arranged in an 8 by 8 array ..." at column 2, line 56).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to divide the images of Fant into eight by eight blocks of pixels (i.e., 64-pixel blocks) for subsequent processing of the images in order to "optimize" computational efficiency by performing successive operations on individual 64-pixel blocks instead of on the entire image all at once. That is, Tescher states, "the relevant criteria for selecting appropriate block sizes are the processing time" (column 12, line 17), and "in general, larger blocks require more processing time" (column 12, line 22), and "a smaller block size may be necessary in order to provide decoded video signals of good subjective quality" (column 12, line 28). Thus, one would be motivated to divide an image into 64-pixel blocks as taught by Tescher in order to "optimize" the "processing time" while at the same time achieving "good subjective quality".

However, the Examiner has not specifically identified which part of Fant is relied upon (Section 7.6.6). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the rejection is based upon references that are directed to different technologies.

- a) Fant is directed to a spatial transform image processing system; and
- b) Tescher is directed to transform domain coding for compression.

However, the Examiner does not provide a proper showing of motivation for the combination thereof nor provide a proper showing of how these references could have been combined (e.g.; Sections 7.8.5, 7.8.6, and 7.8.8). Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection does not establish a proper teaching or suggestion in the prior art suitable to combine the references. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 120, 232, and 571; respectively:

- 120. A process comprising the acts of:
storing at least two digital bits of information in each of a plurality of multibit memory cells;

generating accessed digital information in response to the at least two digital bits of information stored in each of the plurality of multibit memory cells; and
 generating 64-pixel blocks of image information in response to the accessed digital information.

232. A process comprising the acts of:
 storing pixel image information;
 generating 64-pixel blocks of image information in response to the pixel image information;
 generating delta subpixel information having subpixel resolution in response to the pixel image information and in response to feedback information; and
 generating the feedback information in response to the delta subpixel information.

571. A process comprising the acts of:
 storing computer instructions;
 generating navigation information in response to the computer instructions;
 generating video camera information with a video camera; and
 generating 64-pixel blocks of image information in response to the computer instructions and in response to the video camera information.

For example, the Examiner admits to not giving any weight to so-called “intended use [claim] limitations” (*see, e.g.*; Table 5.1) and the Examiner has apparently not given weight to “in response to” claim limitations (*see, e.g.*; Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (*e.g.*; Section 7.6.5).

7.8.9.6 The § 103 rejection over Fant, Tescher, and Taylor

The Examiner states (instant Action at 152-154):

23. Claim 211, as well as its corresponding dependent claims, are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Fant (US 4,835,532 A) and Tescher (US 4,541,012 A) and Taylor et al. (US 4,563,703 A).

Notes:

- Intended use limitations in the body of the claim are not given weight.

- The details of Fant as described above are incorporated herein by reference, and will not be repeated here.

While Fant discloses the storage and processing of digital images ("digital disk ... 12-bit data" at column 9, line 13), Fant does not teach processing the images as 8 X 8 or 64-pixel blocks of image information.

Tescher discloses an image processing system comprising dividing the images into eight by eight pixel blocks, or stated another way, into 64-pixel blocks ("In the preferred embodiment, the method is optimized by employing a total of 64 pixels per block arranged in an 8 by 8 array ..." at column 2, line 56).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to divide the images of Fant into eight by eight blocks of pixels (i.e., 64-pixel blocks) for subsequent processing of the images in order to "optimize" computational efficiency by performing successive operations on individual 64-pixel blocks instead of on the entire image all at once. That is, Tescher states, "the relevant criteria for selecting appropriate block sizes are the processing time" (column 12, line 17), and "in general, larger blocks require more processing time" (column 12, line 22), and "a smaller block size may be necessary in order to provide decoded video signals of good subjective quality" (column 12, line 28). Thus, one would be motivated to divide an image into 64-pixel blocks as taught by Tescher in order to "optimize" the "processing time" while at the same time achieving "good subjective quality".

While Fant discloses warping by translating and scaling an image, Fant does not disclose processor for both weighting and scaling the image.

Taylor discloses a system for provide "special effects" (column 1, line 7) to "reconstitute a picture of different shape or size to that input to the store" (column 1, line 13), which is "capable of producing greater flexibility in picture manipulation whilst maintaining picture quality so that the resultant picture is not noticeably degraded" at column 1, line 20. Taylor's system comprises weighting (figure 3, numeral 20; "K" weights incoming pixels) and scaling (figure 3, numeral 38; the output of summer 38 includes a reduced size image, such as that depicted in figure 2c; e.g., "2:1 reduction in picture size" at column 3, line 26) using integral and fractional addresses (figure 3, numeral 12). Taylor's system is also capable of range variable processing (figure 5; "variable compression" at column 3, line 43).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to incorporate the special effects

processing of Taylor into the object channel processing, scene construction and/or special effects processing blocks of Fant (e.g., figure 3), in order to provide the translation and scaling processing required by Fant, thereby providing Fant with the additional capability of producing special effects not currently supported (e.g., Taylor figure 5), and because of its capability of "producing greater flexibility in picture manipulation whilst maintaining picture quality so that the resultant picture is not noticeably degraded" (Taylor, column 1, line 20).

However, the Examiner has not specifically identified which part of Fant is relied upon (Section 7.6.6). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Taylor does not expressly teach such "weighting" at "figure 3, numeral 20; "K" weights incoming pixels" nor "scaling" at "figure 3, numeral 38; the output of summer 38 includes a reduced size image, such as that depicted in figure 2c; e.g., "2:1 reduction in picture size" at column 3, line 26".

Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection is based upon references that are directed to different technologies.

- a) Fant is directed to a spatial transform image processing system;
- b) Tescher is directed to transform domain coding for compression; and
- c) Taylor is directed to video processing and framestore addressing.

However, the Examiner does not provide a proper showing of motivation for the combination thereof nor provide a proper showing of how these references could have been combined (e.g.; Sections 7.8.5, 7.8.6, and 7.8.8). Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection does not establish a proper teaching or suggestion in the prior art suitable to combine the references. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 211:

211. A process comprising the acts of:
 generating data compressed 64-pixel blocks of image
 information;
 storing weight information;
 storing scale factor information; and

generating 64-pixel blocks of scaled weighted image information in response to the weight information, in response to the scale factor information, and in response to the data compressed 64-pixel blocks of image information.

For example, the Examiner admits to not giving any weight to so-called "intended use [claim] limitations" (*see, e.g.*; Table 5.1) and the Examiner has apparently not given weight to "in response to" claim limitations (*see, e.g.*; Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (*e.g.*; Section 7.6.5).

7.8.9.7 The § 103 rejection over Fant, Tescher, and Mosier

The Examiner states (instant Action at 154-156):

24. Claims 556 and 572, as well as their corresponding dependent claims, are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Fant (US 4,835,532 A) and Tescher (US 4,541,012 A) and Mosier (US 4,583,094 A).

Notes:

- Intended use limitations in the body of the claim are not given weight.
- The details of Fant as described above are incorporated herein by reference, and will not be repeated here.

While Fant discloses the storage and processing of digital images ("digital disk ... 12-bit data" at column 9, line 13), Fant does not teach processing the images as 8 X 8 or 64-pixel blocks of image information.

Tescher discloses an image processing system comprising dividing the images into eight by eight pixel blocks, or stated another way, into 64-pixel blocks ("In the preferred embodiment, the method is optimized by employing a total of 64 pixels per block arranged in an 8 by 8 array ..." at column 2, line 56).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to divide the images of Fant into eight by eight blocks of pixels (*i.e.*, 64-pixel blocks) for subsequent processing of the images in order to "optimize" computational efficiency by performing successive operations on individual 64-pixel blocks instead of on the entire image all at once. That is, Tescher states, "the relevant criteria for selecting appropriate block sizes are the processing time" (column 12, line 17), and "in general, larger blocks require more processing time" (column 12, line 22), and "a smaller block size may be

necessary in order to provide decoded video signals of good subjective quality" (column 12, line 28). Thus, one would be ... motivated to divide an image into 64-pixel blocks as taught by Tescher in order to "optimize" the "processing time" while at the same time achieving "good subjective quality".

Fant teaches a vehicle simulator as already described. In particular, Fant teaches a "flight" simulator comprising generating navigational information ("The helicopter simulator would be equipped with controls for guiding or navigating it in any direction in, around and through the gaming area in the manner of free flight" at column 4, line 60; "determine the locations ... for the primary vehicle" at column 7, line 16). Fant does not elaborate on the "controls for guiding or navigating", and in particular Fant does not teach generating GPS navigation information as part of those controls. However, it is well known in the art that a flight simulator should simulate, as accurately as possible, actual flight including the controls and indicators normally found in a cockpit.

Mosier discloses providing an aircraft with a comprehensive navigation display (figure 1) comprising GPS navigation information received from GPS satellites ("Similarly, global positioning system information can be displayed ..." at column 6, line 12; "GPS" is a satellite based system whereby a plurality of satellites transmit time and position information from which coordinates of a terrestrial vehicle can be determined).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to provide, as part of the controls and indicators of the Fant simulator, the navigation instruments including the GPS information of Mosier, in order to provide the pilot with "a valuable flight assistance tool during both visual flight rules and instrument flight rules flights" (Mosier, column 6, line 19) thereby providing a more realistic flight simulation experience, and to assist the pilot in providing him/her with exact location coordinates, and to provide the specific orientation and navigation inputs to Fant's "vehicle simulation computations" module for subsequently controlling and flight path through the gaming area, thereby simulating as accurately as possible actual flight including the controls and indicators normally found in a cockpit.

However, the Examiner has not specifically identified which part of Fant is relied upon (Section 7.6.6).

Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the rejection is based upon references that are directed to different technologies.

- a) Fant is directed to a spatial transform image processing system;
- b) Tescher is directed to transform domain coding for compression; and
- c) Mosier is directed to an attitude director indicator.

However, the Examiner does not provide a proper showing of motivation for the combination thereof nor provide a proper showing of how these references could have been combined (e.g.; Sections 7.8.5, 7.8.6, and 7.8.8). Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection does not establish a proper teaching or suggestion in the prior art suitable to combine the references. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 556 and 572; respectively:

566. A process comprising the acts of:
 storing computer instructions;
 generating GPS navigation information in response to the
 computer instructions;
 generating infra-red information with an infra-red sensor; and
 generating 64-pixel blocks of image information in response to
 the computer instructions and in response to the infra-red information.

572. A process comprising the acts of:
 storing computer instructions;
 generating GPS navigation information in response to the
 computer instructions;
 generating video camera information with a video camera; and
 generating 64-pixel blocks of image information in response to
 the computer instructions and in response to the video camera
 information.

For example, the Examiner admits to not giving any weight to so-called “intended use [claim] limitations” (*see, e.g.*; Table 5.1) and the Examiner has apparently not given weight to “in response to” claim limitations (*see, e.g.*; Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed

7.8.9.8 The § 103 rejection over Fant, Tescher, and Sidoti

The Examiner states (instant Action at 157-159):

25. Claim 567, as well as its corresponding dependent claims, are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Fant (US 4,835,532 A) and Tescher (US 4,541,012 A) and Sidoti (US 3,885,325 A).

Notes:

- Intended use limitations in the body of the claim are not given weight.
- The details of Fant as described above are incorporated herein by reference, and will not be repeated here.

While Fant discloses the storage and processing of digital images ("digital disk ... 12-bit data" at column 9, line 13), Fant does not teach processing the images as 8 X 8 or 64-pixel blocks of image information.

Tescher discloses an image processing system comprising dividing the images into eight by eight pixel blocks, or stated another way, into 64-pixel blocks ("In the preferred embodiment, the method is optimized by employing a total of 64 pixels per block arranged in an 8 by 8 array ..." at column 2, line 56).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to divide the images of Fant into eight by eight blocks of pixels (i.e., 64-pixel blocks) for subsequent processing of the images in order to "optimize" computational efficiency by performing successive operations on individual 64-pixel blocks instead of on the entire image all at once. That is, Tescher states, "the relevant criteria for selecting appropriate block sizes are the processing time" (column 12, line 17), and "in general, larger blocks require more processing time" (column 12, line 22), and "a smaller block size may be necessary in order to provide decoded video signals of good subjective quality" (column 12, line 28). Thus, one would be motivated to divide an image into 64-pixel blocks as taught by Tescher in order to "optimize" the "processing time" while at the same time achieving "good subjective quality".

Fant teaches a vehicle simulator as already described. In particular, Fant teaches a "flight" simulator comprising generating navigational information ("The helicopter simulator would be equipped with controls for guiding or navigating it in any direction in, around and through the gaming area in the manner of free flight" at column 4, line 60; "determine the locations ... for the primary vehicle" at column 7, line 16). Fant does not elaborate on the "controls for guiding or navigating", and in particular Fant does not teach generating inertial navigation information as part of those controls. However, it is well known in the art

that a flight simulator should simulate, as accurately as possible, actual flight including the controls and indicators normally found in a cockpit.

Sidoti discloses a flight simulator comprising generating inertial navigation information (figure 1, numeral 15; "a directional gyro compass 15" at column 1, line 37).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to provide, as part of the controls and indicators of the Fant simulator, the navigation instruments including the inertial navigation information of Sidoti, in order to "simulate instruments normally found in an aircraft for orientation and navigation" (Sidoti, column 1, line 35) thereby proving a more realistic flight simulation experience, and to provide the specific orientation and navigation inputs to Fant's "vehicle simulation computations" module for subsequently controlling and flight path through the gaming area.

However, the Examiner has not specifically identified which part of Fant is relied upon (Section 7.6.6). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Sidoti does not expressly teach such "inertial navigation information" at "figure 1, numeral 15; ... at column 1, line 37". "[A] directional gyro compass" is not an "inertial navigation" system, it conventionally provides directional information. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection is based upon references that are directed to different technologies.

- a) Fant is directed to a spatial transform image processing system;
- b) Tescher is directed to transform domain coding for compression; and
- c) Sidoti is directed to a flight simulator.

However, the Examiner does not provide a proper showing of motivation for the combination thereof nor provide a proper showing of how these references could have been combined (e.g.; Sections 7.8.5, 7.8.6, and 7.8.8). Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection does not establish a proper teaching or suggestion in the prior art suitable to combine the references. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 567:

567. A process comprising the acts of:
 storing computer instructions;
 generating inertial navigation information in response to the
 computer instructions;
 generating infra-red information with an infra-red sensor; and
 generating 64-pixel blocks of image information in response to
 the computer instructions and in response to the infra-red information.

For example, the Examiner admits to not giving any weight to so-called "intended use [claim] limitations" (*see, e.g.*; Table 5.1) and the Examiner has apparently not given weight to "in response to" claim limitations (*see, e.g.*; Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (*e.g.*; Section 7.6.5).

7.8.9.9 The § 103 rejection over Fant and Mosier

The Examiner states (instant Action at 159-160):

26. Claims 139, 196, 252, 422, 427, 558, 568, 570, 574 and 582, as well as their corresponding dependent claims, are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Fant (US 4,835,532 A) and Mosier (US 4,583,094 A).

Notes:

- Intended use limitations in the body of the claim are not given weight.
- The details of Fant as described above are incorporated herein by reference, and will not be repeated here.

Fant teaches a vehicle simulator as already described. In particular, Fant teaches a "flight" simulator comprising generating navigational information ("The helicopter simulator would be equipped with controls for guiding or navigating it in any direction in, around and through the gaming area in the manner of free flight" at column 4, line 60; "determine the locations ... for the primary vehicle" at column 7, line 16). Fant does not elaborate on the "controls for guiding or navigating", and in particular Fant does not teach generating GPS navigation information as part of those controls. However, it is well known in the art that a flight simulator should simulate, as accurately as possible, actual flight including the controls and indicators normally found in a cockpit.

Mosier discloses providing an aircraft with a comprehensive navigation display (figure 1) comprising GPS navigation information received from GPS satellites ("Similarly, global positioning system information can be displayed ..." at column 6, line 12; "GPS" is a

satellite based system whereby a plurality of satellites transmit time and position information from which coordinates of a terrestrial vehicle can be determined).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to provide, as part of the controls and indicators of the Fant simulator, the navigation instruments including the GPS information of Mosier, in order to provide the pilot with "a valuable flight assistance tool during both visual flight rules and instrument flight rules flights" (Mosier, column 6, line 19) thereby proving a more realistic flight simulation experience, and to assist the pilot in providing him/her with exact location coordinates, and to provide the specific orientation and navigation inputs to Fant's "vehicle simulation computations" module for subsequently controlling and flight path through the gaming area, thereby simulating as accurately as possible actual flight including the controls and indicators normally found in a cockpit.

However, the Examiner has not specifically identified which part of Fant is relied upon (Section 7.6.6). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the rejection is based upon references that are directed to different technologies.

- a) Fant is directed to a spatial transform image processing system; and
- b) Mosier is directed to an attitude director indicator.

However, the Examiner does not provide a proper showing of motivation for the combination thereof nor provide a proper showing of how these references could have been combined (e.g.; Sections 7.8.5, 7.8.6, and 7.8.8). Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection does not establish a proper teaching or suggestion in the prior art suitable to combine the references. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 558, 570, and 582; respectively:

- 558. A process comprising the acts of:
 - storing computer instructions;
 - generating GPS navigation information in response to the computer instructions;
 - generating radar information;

generating translated image information in response to the computer instructions and in response to the radar information; and
generating overlaid graphics information in response to the computer instructions and in response to the radar information.

570. A process comprising the acts of:
storing computer instructions;
generating GPS navigation information in response to the computer instructions;
generating infra-red information with an infra-red sensor; and
generating pattern recognition information in response to the computer instructions and in response to the infra-red information.

582. A process comprising the acts of:
storing computer instructions;
generating GPS navigation information in response to the computer instructions;
generating camera information with a camera;
generating pattern recognition information in response to the computer instructions and in response to the camera information; and
generating rotated image information in response to the computer instructions and in response to the camera information.

For example, the Examiner admits to not giving any weight to so-called “intended use [claim] limitations” (*see, e.g.*; Table 5.1) and the Examiner has apparently not given weight to “in response to” claim limitations (*see, e.g.*; Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (*e.g.*; Section 7.6.5).

7.8.9.10 The § 103 rejection over Fant, Mosier, and Cleminson

The Examiner states (instant Action at 160-163):

27. Claims 274, 552 and 577 as well as their corresponding dependent claims, are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Fant (US 4,835,532 A) and Mosier (US 4,583,094 A) and Cleminson (US 4,675,829 A).

Notes:

- Intended use limitations in the body of the claim are not given weight.
- The details of Fant as described above are incorporated herein by reference, and will not be repeated here.

Fant teaches a vehicle simulator as already described. In particular, Fant teaches a "flight" simulator comprising generating navigational information ("The helicopter simulator would be equipped with controls for guiding or navigating it in any direction in, around and through the gaming area in the manner of free flight" at column 4, line 60; "determine the locations ... for the primary vehicle" at column 7, line 16). Fant does not elaborate on the "controls for guiding or navigating", and in particular Fant does not teach generating GPS navigation information as part of those controls. However, it is well known in the art that a flight simulator should simulate, as accurately as possible, actual flight including the controls and indicators normally found in a cockpit.

Mosier discloses providing an aircraft with a comprehensive navigation display (figure 1) comprising GPS navigation information received from GPS satellites ("Similarly, global, positioning system information can be displayed ..." at column 6, line 12; "GPS" is a satellite based system whereby a plurality of satellites transmit time and position information from which coordinates of a terrestrial vehicle can be determined).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to provide, as part of the controls and indicators of the Fant simulator, the navigation instruments including the GPS information of Mosier, in order to provide the pilot with "a valuable flight assistance tool during both visual flight rules and instrument flight rules flights" (Mosier, column 6, line 19) thereby providing a more realistic flight simulation experience, and to assist the pilot in providing him/her with exact location coordinates, and to provide the specific orientation and navigation inputs to Fant's "vehicle simulation computations" module for subsequently controlling and flight path through the gaming area, thereby simulating as accurately as possible actual flight including the controls and indicators normally found in a cockpit.

The various modules (e.g., figure 3) of the Fant system each make artificial intelligence type decisions as described above, thus adhering to the construction of the term "artificial intelligence" as applied by the examiner. However, these processing blocks do not adhere to a more rigorous definition of "artificial intelligence" (not relied upon by the examiner) in the art. However, even if Fant does not meet a more rigorous definition, the use of artificial intelligence would have been obvious at the time the invention was made as follows.

Cleminson states, at column 1, lines 10-34:

"Artificial intelligence (AI) technology is a discipline with an ultimate goal of providing a machine that is capable of reasoning, making inferences and following rules in a manner believed to model the

human mind. A great deal of theoretical work has been done in this discipline, and much remains to be done. Artificial intelligence theory is beginning to find applications because of the hope that its principles can be effectively applied to develop better computer software and to provide to relatively untrained users sophisticated computer power to solve practical problems such as to assist in the analysis of massive amounts of relatively unprocessed data to aid in decision-making processes.

As AI technology begins to demonstrate potential and practical uses, tools are needed to speed development of practical computational systems. AI specialists have developed a number of AI-dedicated computer languages to assist in this development. Among the languages are LISP and PROLOG. However, these languages are not particularly easy for either skilled AI researchers or minimally-trained user/programmers to use to develop sophisticated and complex knowledge bases necessary to solve the problems related to artificial intelligence applications. Hence, tools are needed which are better suited to the requirements of both a minimally-trained knowledge base user and a skilled AI researcher."

It would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the artificial intelligence processing as described by Cleminson above, either in the software and/or hardware of Fant's various processing modules (e.g., figure 3), in order to:

provide "a machine that is capable of reasoning, making inferences and following rules in a manner believed to model the human mind", and

"to develop better computer software and to provide to relatively untrained users sophisticated computer power to solve practical problems such as to assist in the analysis of massive amounts of relatively unprocessed data to aid in decision-making processes",

Thereby improving the speed and accuracy with which Fant's processing modules make their respective decisions.

However, the Examiner has not specifically identified which part of Fant is relied upon (Section 7.6.6). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the rejection is based upon references that are directed to different technologies.

- a) Fant is directed to a spatial transform image processing system;
- b) Mosier is directed to an attitude director indicator; and

c) Cleminson is directed to knowledge-based systems.

However, the Examiner does not provide a proper showing of motivation for the combination thereof nor provide a proper showing of how these references could have been combined (e.g.; Sections 7.8.5, 7.8.6, and 7.8.8). Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection does not establish a proper teaching or suggestion in the prior art suitable to combine the references. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 274, 552 and 577; respectively:

274. A process comprising the acts of:
 storing computer instructions;
 generating GPS navigation information in response to the
 computer instructions;
 generating radar information; and
 generating artificial intelligence information in response to the
 computer instructions and in response to the radar information.

552. A process comprising the acts of:
 storing computer instructions;
 generating GPS navigation information in response to the
 computer instructions;
 generating video camera information with a video camera;
 generating artificial intelligence information in response to the
 computer instructions and in response to the video camera information;
 and
 loading database information into a database memory in
 response to the computer instructions and in response to the video
 camera information.

577. A process comprising the acts of:
 storing computer instructions;
 generating GPS navigation information in response to the
 computer instructions;
 generating camera information with a camera; and
 generating artificial intelligence information in response to the
 computer instructions and in response to the camera information.

For example, the Examiner admits to not giving any weight to so-called "intended use [claim] limitations" (*see, e.g.*; Table 5.1) and the Examiner has apparently not given weight to "in response to" claim limitations (*see, e.g.*; Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (*e.g.*; Section 7.6.5).

7.8.9.11 The § 103 rejection over Fant, Mosier, and Tabata

The Examiner states (instant Action at 163-166):

28. Claims 536, 554 and 563, as well as their corresponding dependent claims, are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Fant (US 4,835,532 A) and Mosier (US 4,583,094 A) and Tabata et al. (US 4,574,364 A).

Notes:

- Intended use limitations in the body of the claim are not given weight.
- The details of Fant as described above are incorporated herein by reference, and will not be repeated here.

Fant teaches a vehicle simulator as already described. In particular, Fant teaches a "flight" simulator comprising generating navigational information ("The helicopter simulator would be equipped with controls for guiding or navigating it in any direction in, around and through the gaming area in the manner of free flight" at column 4, line 60; "determine the locations ... for the primary vehicle" at column 7, line 16). Fant does not elaborate on the "controls for guiding or navigating", and in particular Fant does not teach generating GPS navigation information as part of those controls. However, it is well known in the art that a flight simulator should simulate, as accurately as possible, actual flight including the controls and indicators normally found in a cockpit.

Mosier discloses providing an aircraft with a comprehensive navigation display (figure 1) comprising GPS navigation information received from GPS satellites ("Similarly, global positioning system information can be displayed ..." at column 6, line 12; "GPS" is a satellite based system whereby a plurality of satellites transmit time and position information from which coordinates of a terrestrial vehicle can be determined).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to provide, as part of the controls and indicators of the Fant simulator, the navigation instruments including the GPS information of Mosier, in order to provide the pilot with "a valuable flight assistance tool during both visual flight rules and

instrument flight rules flights" (Mosier, column 6, line 19) thereby proving a more realistic flight simulation experience, and to assist the pilot in providing him/her with exact location coordinates, and to provide the specific orientation and navigation inputs to Fant's "vehicle simulation computations" module for subsequently controlling and flight path through the gaming area, thereby simulating as accurately as possible actual flight including the controls and indicators normally found in a cockpit.

While Fant teaches the storage of digital image information on the object library disk memory as described above, Fant does not teach compression of the images for storage, and decompression for retrieval.

Tabata discloses a system for the storage of images in a database (figure 3, numeral 5), comprising compressing the images for storage and decompression for display (figure 3, numerals 6 and 10; "for compressing and decompressing the image data" at column 2, line 60).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to perform the compression and decompression of images as taught by Tabata, on the images stored and retrieved from the object data base of Fant, in order to efficiently store the images and thus provide room for the storage of even more images that might not otherwise fit on the optical disk in uncompressed form.

Additionally, it would have been obvious to compress and decompress the images for transmission between the processing blocks of Fant, thus reducing the data for transmission and increasing transmission speed.

However, the Examiner has not specifically identified which part of Fant is relied upon (Section 7.6.6). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Tabata does not expressly teach such "a database" at "figure 3, numeral 5" nor that "file device 5" is a database. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection is based upon references that are directed to different technologies.

- a) Fant is directed to a spatial transform image processing system;
- b) Mosier is directed to an attitude director indicator; and
- c) Tabata is directed to controlling an image display.

However, the Examiner does not provide a proper showing of motivation for the combination thereof nor provide a proper showing of how these references could have been combined (e.g.; Sections 7.8.5, 7.8.6, and 7.8.8). Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection does not establish a proper teaching or suggestion in the prior art suitable to combine the references. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 536, 554 and 563; respectively:

536. A process comprising the acts of:
 storing computer instructions;
 generating GPS navigation information in response to the
 computer instructions;
 generating camera information with a camera; and
 generating data compressed image information in response to
 the computer instructions and in response to the camera information.

554. A process comprising the acts of:
 storing computer instructions;
 generating GPS navigation information in response to the
 computer instructions;
 generating radar information;
 generating data compressed image information in response to
 the computer instructions and in response to the radar information; and
 loading database information into a database memory in
 response to the computer instructions and in response to the radar
 information.

563. A process comprising the acts of:
 storing computer instructions;
 generating GPS navigation information in response to the
 computer instructions;
 generating infra-red information with an infra-red sensor; and
 generating data compressed image information in response to
 the computer instructions and in response to the infra-red information.

For example, the Examiner admits to not giving any weight to so-called “intended use [claim] limitations” (*see, e.g.*; Table 5.1) and the Examiner has apparently not given weight to “in response to” claim limitations (*see, e.g.*; Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

7.8.9.12 The § 103 rejection over Fant and Tabata

The Examiner states (instant Action at 166-167):

29. Claim 147, as well as its corresponding dependent claims, are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Fant (US 4,835,532 A) and Tabata et al. (US 4,574,364 A).

Notes:

- Intended use limitations in the body of the claim are not given weight.
- The details of Fant as described above are incorporated herein by reference, and will not be repeated here.

While Fant teaches the storage of digital image information on the object library disk memory as described above, Fant does not teach compression of the images for storage, and decompression for retrieval.

Tabata discloses a system for the storage of images in a database (figure 3, numeral 5), comprising compressing the images for storage and decompression for display (figure 3, numerals 6 and 10; "for compressing and decompressing the image data" at column 2, line 60).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to perform the compression and decompression of images as taught by Tabata, on the images stored and retrieved from the object data base of Fant, in order to efficiently store the images and thus provide room for the storage of even more images that might not otherwise fit on the optical disk in uncompressed form.

Additionally, it would have been obvious to compress and decompress the images for transmission between the processing blocks of Fant, thus reducing the data for transmission and increasing transmission speed.

However, the Examiner has not specifically identified which part of Fant is relied upon (Section 7.6.6).

Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Tabata does not expressly teach such "a database" at "figure 3, numeral 5" nor that "file device 5" is a database. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection is based upon references that are directed to different technologies.

a) Fant is directed to a spatial transform image processing system; and

b) Tabata is directed to controlling an image display.

However, the Examiner does not provide a proper showing of motivation for the combination thereof nor provide a proper showing of how these references could have been combined (e.g.; Sections 7.8.5, 7.8.6, and 7.8.8). Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection does not establish a proper teaching or suggestion in the prior art suitable to combine the references. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 147:

147. A process comprising the acts of:
 storing data compressed image information in a database
 memory; and
 generating temporally interpolated image information in
 response to the data compressed image information.

For example, the Examiner admits to not giving any weight to so-called “intended use [claim] limitations” (*see, e.g.*; Table 5.1) and the Examiner has apparently not given weight to “in response to” claim limitations (*see, e.g.*; Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

7.8.9.13 The § 103 rejection over Fant, Tabata, and Taylor

The Examiner states (instant Action at 167-169):

30. Claims 195 and 219, as well as their corresponding dependent claims, are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Fant (US 4,835,532 A) and Tabata et al. (US 4,574,364 A) and Taylor et al. (US 4,563,703 A).

Notes:

- Intended use limitations in the body of the claim are not given weight.
- The details of Fant as described above are incorporated herein by reference, and will not be repeated here.

While Fant teaches the storage of digital image information on the object library disk memory as described above, Fant does not teach compression of the images for storage, and decompression for retrieval.

Tabata discloses a system for the storage of images in a database (figure 3, numeral 5), comprising compressing the images for storage and decompression for display (figure 3, numerals 6 and 10; "for compressing and decompressing the image data" at column 2, line 60).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to perform the compression and decompression of images as taught by Tabata, on the images stored and retrieved from the object data base of Fant, in order to efficiently store the images and thus provide room for the storage of even more images that might not otherwise fit on the optical disk in uncompressed form.

Additionally, it would have been obvious to compress and decompress the images for transmission between the processing blocks of Fant, thus reducing the data for transmission and increasing transmission speed.

While Fant discloses warping by translating and scaling an image, Fant does not disclose processor for both weighting and scaling the image.

Taylor discloses a system for provide "special effects" (column 1, line 7) to "reconstitute a picture of different shape or size to that input to the store" (column 1, line 13), which is "capable of producing greater flexibility in picture manipulation whilst maintaining picture quality so that the resultant picture is not noticeably degraded" at column 1, line 20. Taylor's system comprises weighting (figure 3, numeral 20; "K" weights incoming pixels) and scaling (figure 3, numeral 38; the output of summer 38 includes a reduced size image, such as that depicted in figure 2c; e.g., "2:1 reduction in picture size" at column 3, line 26) using integral and fractional addresses (figure 3, numeral 12). Taylor's system is also capable of range variable processing (figure 5; "variable compression" at column 3, line 43).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to incorporate the special effects processing of Taylor into the object channel processing, scene construction and/or special effects processing blocks of Fant (e.g., figure 3), in order to provide the translation and scaling processing required by Fant, thereby providing Fant with the additional capability of producing special effects not currently supported (e.g., Taylor figure 5), and because of its capability of "producing greater flexibility in picture manipulation whilst maintaining picture quality so that the resultant picture is not noticeably degraded" (Taylor, column 1, line 20).

However, the Examiner has not specifically identified which part of Fant is relied upon (Section 7.6.6). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Tabata does not expressly teach such “a database” at “figure 3, numeral 5” nor that “file device 5” is a database. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, Taylor does not expressly teach such “weighting” at “figure 3, numeral 20; “K” weights incoming pixels” nor “scaling” at “figure 3, numeral 38; the output of summer 38 includes a reduced size image, such as that depicted in figure 2c; e.g., “2:1 reduction in picture size” at column 3, line 26”. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection is based upon references that are directed to different technologies.

- a) Fant is directed to a spatial transform image processing system;
- b) Tabata is directed to controlling an image display; and
- c) Taylor is directed to video processing and framestore addressing.

However, the Examiner does not provide a proper showing of motivation for the combination thereof nor provide a proper showing of how these references could have been combined (e.g.; Sections 7.8.5, 7.8.6, and 7.8.8). Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection does not establish a proper teaching or suggestion in the prior art suitable to combine the references. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 195 and 219; respectively:

- 195. A process comprising the acts of:
 - generating data compressed image information;
 - storing weight information;
 - storing scale factor information;
 - generating scaled weighted image information in response to the weight information, in response to the scale factor information, and in response to the data compressed image information;
 - generating transformed image information in response to the scaled weighted image information; and
 - generating temporally interpolated image information in response to the transformed image information.

219. A process comprising the acts of:
 generating data compressed image information;
 generating scaled weighted image information in response to the
 data compressed image information;
 generating transformed image information in response to the
 scaled weighted image information; and
 generating feedback image information in response to the
 transformed image information.

For example, the Examiner admits to not giving any weight to so-called “intended use [claim] limitations” (*see, e.g.*; Table 5.1) and the Examiner has apparently not given weight to “in response to” claim limitations (*see, e.g.*; Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (*e.g.*; Section 7.6.5).

7.8.9.14 The § 103 rejection over Fant, Tabata, and Sidoti

The Examiner states (instant Action at 169-171):

31. Claim 583, as well as its corresponding dependent claims, are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Fant (US 4,835,532 A) and Tabata et al. (US 4,574,364 A) and Sidoti (US 3,885,325 A).

Notes:

- Intended use limitations in the body of the claim are not given weight.
- The details of Fant as described above are incorporated herein by reference, and will not be repeated here.

While Fant teaches the storage of digital image information on the object library disk memory as described above, Fant does not teach compression of the images for storage, and decompression for retrieval.

Tabata discloses a system for the storage of images in a database (figure 3, numeral 5), comprising compressing the images for storage and decompression for display (figure 3, numerals 6 and 10; “for compressing and decompressing the image data” at column 2, line 60).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to perform the compression and decompression of images as taught by Tabata, on the images stored and retrieved from the object data base of Fant, in order to efficiently store

the images and thus provide room for the storage of even more images that might not otherwise fit on the optical disk in uncompressed form.

Additionally, it would have been obvious to compress and decompress the images for transmission between the processing blocks of Fant, thus reducing the data for transmission and increasing transmission speed.

Fant teaches a vehicle simulator as already described. In particular, Fant teaches a "flight" simulator comprising generating navigational information ("The helicopter simulator would be equipped with controls for guiding or navigating it in any direction in, around and through the gaming area in the manner of free flight" at column 4, line 60; "determine the locations ... for the primary vehicle" at column 7, line 16). Fant does not elaborate on the "controls for guiding or navigating", and in particular Fant does not teach generating inertial navigation information as part of those controls. However, it is well known in the art that a flight simulator should simulate, as accurately as possible, actual flight including the controls and indicators normally found in a cockpit.

Sidoti discloses a flight simulator comprising generating inertial navigation information (figure 1, numeral 15; "a directional gyro compass 15" at column 1, line 37).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to provide, as part of the controls and indicators of the Fant simulator, the navigation instruments including the inertial navigation information of Sidoti, in order to "simulate instruments normally found in an aircraft for orientation and navigation" (Sidoti, column 1, line 35) thereby providing a more realistic flight simulation experience, and to provide the specific orientation and navigation inputs to Fant's "vehicle simulation computations" module for subsequently controlling and flight path through the gaming area.

However, the Examiner has not specifically identified which part of Fant is relied upon (Section 7.6.6). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Tabata does not expressly teach such "a database" at "figure 3, numeral 5" nor that "file device 5" is a database. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, Sidoti does not expressly teach such "inertial navigation information" at "figure 1, numeral 15; ... at column 1, line 37". "[A] directional gyro compass" is not an "inertial navigation" system, it conventionally provides directional information. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection is based upon references that are directed to different technologies.

- a) Fant is directed to a spatial transform image processing system;
- b) Tabata is directed to controlling an image display; and
- c) Sidoti is directed to a flight simulator.

However, the Examiner does not provide a proper showing of motivation for the combination thereof nor provide a proper showing of how these references could have been combined (e.g.; Sections 7.8.5, 7.8.6, and 7.8.8). Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection does not establish a proper teaching or suggestion in the prior art suitable to combine the references. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 583:

583. A process comprising the acts of:
 storing computer instructions;
 generating inertial navigation information in response to the
 computer instructions;
 generating infra-red information with an infra-red sensor; and
 generating data compressed image information in response to
 the computer instructions and in response to the infra-red information.

For example, the Examiner admits to not giving any weight to so-called “intended use [claim] limitations” (*see, e.g.*; Table 5.1) and the Examiner has apparently not given weight to “in response to” claim limitations (*see, e.g.*; Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

7.8.9.15 The § 103 rejection over Fant and Cleminson

The Examiner states (instant Action at 171-173):

32. Claims 159, 161, 163, 165 and 193, as well as their corresponding dependent claims, are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Fant (US 4,835,532 A) and Cleminson (US 4,675,829 A).

Notes:

- Intended use limitations in the body of the claim are not given weight.

- The details of Fant as described above are incorporated herein by reference, and will not be repeated here.

The various modules (e.g., figure 3) of the Fant system each make artificial intelligence type decisions as described above, thus adhering to the construction of the term "artificial intelligence" as applied by the examiner. However, these processing blocks do not adhere to a more rigorous definition of "artificial intelligence" (not relied upon by the examiner) in the art. However, even if Fant does not meet a more rigorous definition, the use of artificial intelligence would have been obvious at the time the invention was made as follows.

Cleminson states, at column 1, lines 10-34:

"Artificial intelligence (AI) technology is a discipline with an ultimate goal of providing a machine that is capable of reasoning, making inferences and following rules in a manner believed to model the human mind. A great deal of theoretical work has been done in this discipline, and much remains to be done. Artificial intelligence theory is beginning to find applications because of the hope that its principles can be effectively applied to develop better computer software and to provide to relatively untrained users sophisticated computer power to solve practical problems such as to assist in the analysis of massive amounts of relatively unprocessed data to aid in decision-making processes.

As AI technology begins to demonstrate potential and practical uses, tools are needed to speed development of practical computational systems. AI specialists have developed a number of AI-dedicated computer languages to assist in this development. Among the languages are LISP and PROLOG. However, these languages are not particularly easy for either skilled AI researchers or minimally-trained user/programmers to use to develop sophisticated and complex knowledge bases necessary to solve the problems related to artificial intelligence applications. Hence, tools are needed which are better suited to the requirements of both a minimally-trained knowledge base user and a skilled AI researcher."

It would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the artificial intelligence processing as described by Cleminson above, either in the software and/or hardware of Fant's various processing modules (e.g., figure 3), in order to:

provide "a machine that is capable of reasoning, making inferences and following rules in a manner believed to model the human mind", and

"to develop better computer software and to provide to relatively untrained users sophisticated computer power to solve practical problems such as to assist in the analysis of massive amounts of relatively unprocessed data to aid in decision-making processes",

Thereby improving the speed and accuracy with which Fant's processing modules make their respective decisions.

However, the Examiner has not specifically identified which part of Fant is relied upon (Section 7.6.6). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the rejection is based upon references that are directed to different technologies.

a) Fant is directed to a spatial transform image processing system; and

b) Cleminson is directed to knowledge-based systems.

However, the Examiner does not provide a proper showing of motivation for the combination thereof nor provide a proper showing of how these references could have been combined (e.g.; Sections 7.8.5, 7.8.6, and 7.8.8). Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection does not establish a proper teaching or suggestion in the prior art suitable to combine the references. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 161, 165 and 193; respectively:

161. A process comprising the acts of:
storing computer instructions;
generating infra-red image information; and
generating artificial intelligence information in response to the
infra-red image information and in response to the computer
instructions.

165. A process comprising the acts of:
storing computer instructions;
generating tomographic image information; and
generating artificial intelligence information in response to the
tomographic image information and in response to the computer
instructions.

193. A process comprising the acts of:

storing computer instructions;
generating television image information; and
generating artificial intelligence information in response to the
television image information and in response to the computer
instructions.

For example, the Examiner admits to not giving any weight to so-called "intended use [claim] limitations" (*see, e.g.*; Table 5.1) and the Examiner has apparently not given weight to "in response to" claim limitations (*see, e.g.*; Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (*e.g.*; Section 7.6.5).

7.8.9.16 The § 103 rejection over Fant, Cleminson, and Sidoti

The Examiner states (instant Action at 173-176):

33. Claim 569, as well as its corresponding dependent claims, are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Fant (US 4,835,532 A) and Cleminson (US 4,675,829 A) and Sidoti (US 3,885,325 A).

Notes:

- Intended use limitations in the body of the claim are not given weight.
- The details of Fant as described above are incorporated herein by reference, and will not be repeated here.

The various modules (*e.g.*, figure 3) of the Fant system each make artificial intelligence type decisions as described above, thus adhering to the construction of the term "artificial intelligence" as applied by the examiner. However, these processing blocks do not adhere to a more rigorous definition of "artificial intelligence" (not relied upon by the examiner) in the art. However, even if Fant does not meet a more rigorous definition, the use of artificial intelligence would have been obvious at the time the invention was made as follows.

Cleminson states, at column 1, lines 10-34:

"Artificial intelligence (AI) technology is a discipline with an ultimate goal of providing a machine that is capable of reasoning, making inferences and following rules in a manner believed to model the human mind. A great deal of theoretical work has been done in this discipline, and much remains to be done. Artificial intelligence theory is beginning to find applications because of the hope that its principles can be effectively applied to develop better computer software and to provide to relatively untrained users sophisticated computer power to

solve practical problems such as to assist in the analysis of massive amounts of relatively unprocessed data to aid in decision-making processes.

As AI technology begins to demonstrate potential and practical uses, tools are needed to speed development of practical computational systems. AI specialists have developed a number of AI-dedicated computer languages to assist in this development. Among the languages are LISP and PROLOG. However, these languages are not particularly easy for either skilled AI researchers or minimally-trained user/programmers to use to develop sophisticated and complex knowledge bases necessary to solve the problems related to artificial intelligence applications; Hence, tools are needed which are better suited to the requirements of both a minimally-trained knowledge base user and a skilled AI researcher."

It would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the artificial intelligence processing as described by Cleminson above, either in the software and/or hardware of Fant's various processing modules (e.g., figure 3), in order to:

provide "a machine that is capable of reasoning, making inferences and following rules in a manner believed to model the human mind", and

"to develop better computer software and to provide to relatively untrained users sophisticated computer power to solve practical problems such as to assist in the analysis of massive amounts of relatively unprocessed data to aid in decision-making processes",

Thereby improving the speed and accuracy with which Fant's processing modules make their respective decisions.

Fant teaches a vehicle simulator as already described. In particular, Fant teaches a "flight" simulator comprising generating navigational information ("The helicopter simulator would be equipped with controls for guiding or navigating it in any direction in, around and through the gaming area in the manner of free flight" at column 4, line 60; "determine the locations ... for the primary vehicle" at column 7, line 16). Fant does not elaborate on the "controls for guiding or navigating", and in particular Fant does not teach generating inertial navigation information as part of those controls. However, it is well known in the art that a flight simulator should simulate, as accurately as possible, actual flight including the controls and indicators normally found in a cockpit.

Sidoti discloses a flight simulator comprising generating inertial navigation information (figure 1, numeral 15; "a directional gyro compass 15" at column 1, line 37).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to provide, as part of the controls and indicators of the Fant simulator, the navigation instruments including the inertial navigation information of Sidoti, in order to "simulate instruments normally found in an aircraft for orientation and navigation" (Sidoti, column 1, line 35) thereby proving a more realistic flight simulation experience, and to provide the specific orientation and navigation inputs to Fant's "vehicle simulation computations" module for subsequently controlling and flight path through the gaming area.

However, the Examiner has not specifically identified which part of Fant is relied upon (Section 7.6.6). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Sidoti does not expressly teach such "inertial navigation information" at "figure 1, numeral 15; ... at column 1, line 37". "[A] directional gyro compass" is not an "inertial navigation" system, it conventionally provides directional information. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection is based upon references that are directed to different technologies.

- a) Fant is directed to a spatial transform image processing system;
- b) Cleminson is directed to knowledge-based systems; and
- c) Sidoti is directed to a flight simulator.

However, the Examiner does not provide a proper showing of motivation for the combination thereof nor provide a proper showing of how these references could have been combined (e.g.; Sections 7.8.5, 7.8.6, and 7.8.8). Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection does not establish a proper teaching or suggestion in the prior art suitable to combine the references. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 569:

569. A process comprising the acts of:
 storing computer instructions;
 generating inertial navigation information in response to the
 computer instructions;

generating infra-red information with an infra-red sensor; and
generating artificial intelligence information in response to the
computer instructions and in response to the infra-red information.

For example, the Examiner admits to not giving any weight to so-called "intended use [claim] limitations" (*see, e.g.*; Table 5.1) and the Examiner has apparently not given weight to "in response to" claim limitations (*see, e.g.*; Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (*e.g.*; Section 7.6.5).

7.8.9.17 The § 103 rejection over Fant and Sidoti

The Examiner states (instant Action at 176-177):

34. Claims 190, 258, 276, 515, 549, 550, 562, 565 and 581, as well as their corresponding dependent claims, are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Fant (US 4,835,532 A) and Sidoti (US 3,885,325 A).

Notes:

- Intended use limitations in the body of the claim are not given weight.
- The details of Fant as described above are incorporated herein by reference, and will not be repeated here.

Fant teaches a vehicle simulator as already described. In particular, Fant teaches a "flight" simulator comprising generating navigational information ("The helicopter simulator would be equipped with controls for guiding or navigating it in any direction in, around and through the gaming area in the manner of free flight" at column 4, line 60; "determine the locations ... for the primary vehicle" at column 7, line 16). Fant does not elaborate on the "controls for guiding or navigating", and in particular Fant does not teach generating inertial navigation information as part of those controls. However, it is well known in the art that a flight simulator should simulate, as accurately as possible, actual flight including the controls and indicators normally found in a cockpit.

Sidoti discloses a flight simulator comprising generating inertial navigation information (figure 1, numeral 15; "a directional gyro compass 15" at column 1, line 37).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to provide, as part of the controls and indicators of the Fant simulator, the navigation instruments including the inertial navigation information of Sidoti, in order to "simulate instruments normally found in an aircraft for orientation and navigation" (Sidoti,

column 1, line 35) thereby proving a more realistic flight simulation experience, and to provide the specific orientation and navigation inputs to Fant's "vehicle simulation computations" module for subsequently controlling and flight path through the gaming area.

However, the Examiner has not specifically identified which part of Fant is relied upon (Section 7.6.6). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Sidoti does not expressly teach such "inertial navigation information" at "figure 1, numeral 15; ... at column 1, line 37". "[A] directional gyro compass" is not an "inertial navigation" system, it conventionally provides directional information. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection is based upon references that are directed to different technologies.

- a) Fant is directed to a spatial transform image processing system; and
- b) Sidoti is directed to a flight simulator.

However, the Examiner does not provide a proper showing of motivation for the combination thereof nor provide a proper showing of how these references could have been combined (e.g.; Sections 7.8.5, 7.8.6, and 7.8.8). Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection does not establish a proper teaching or suggestion in the prior art suitable to combine the references. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 276, 562, and 581; respectively:

276. A process comprising the acts of:
 storing computer instructions;
 generating inertial navigation information in response to the computer instructions;
 generating radar information;
 generating overlaid graphics information in response to the computer instructions and in response to the radar information; and
 generating temporally interpolated image information in response to the radar information.

562. A process comprising the acts of:

storing computer instructions;
 generating inertial navigation information in response to the
 computer instructions;
 generating video camera information with a video camera; and
 generating feedback information in response to the computer
 instructions and in response to the video camera information.

581. A process comprising the acts of:
 storing computer instructions;
 generating inertial navigation information in response to the
 computer instructions;
 generating camera information with a camera; and
 generating temporally interpolated image information in
 response to the computer instructions and in response to the camera
 information.

For example, the Examiner admits to not giving any weight to so-called “intended use [claim] limitations” (*see, e.g.*; Table 5.1) and the Examiner has apparently not given weight to “in response to” claim limitations (*see, e.g.*; Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (*e.g.*; Section 7.6.5).

7.8.9.18 The § 103 rejection over Fant, Sidoti, and Lam

The Examiner states (instant Action at 177-179):

35. Claims 551, 560 and 576, as well as their corresponding dependent claims, are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Fant (US 4,835,532 A) and Sidoti (US 3,885,325 A) and Lam et al. (US 4,576,577 A).

Notes:

- Intended use limitations in the body of the claim are not given weight.
- The details of Fant as described above are incorporated herein by reference, and will not be repeated here.

Fant teaches a vehicle simulator as already described. In particular, Fant teaches a "flight" simulator comprising generating navigational information ("The helicopter simulator would be equipped with controls for guiding or navigating it in any direction in, around and through the gaming area in the manner of free flight" at column 4, line 60; "determine the locations ... for the primary vehicle" at column 7, line 16). Fant does not elaborate on the "controls for guiding or navigating",

and in particular Fant does not teach generating inertial navigation information as part of those controls. However, it is well known in the art that a flight simulator should simulate, as accurately as possible, actual flight including the controls and indicators normally found in a cockpit.

Sidoti discloses a flight simulator comprising generating inertial navigation information (figure 1, numeral 15; "a directional gyro compass 15" at column 1, line 37).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to provide, as part of the controls and indicators of the Fant simulator, the navigation instruments including the inertial navigation information of Sidoti, in order to "simulate instruments normally found in an aircraft for orientation and navigation" (Sidoti, column 1, line 35) thereby providing a more realistic flight simulation experience, and to provide the specific orientation and navigation inputs to Fant's "vehicle simulation computations" module for subsequently controlling and flight path through the gaming area.

While Fant teaches a flight simulator, where the operator has "controls for guiding or navigating it in any direction in, around and through the gaming area in the manner of free flight" at column 4, line 62), Fant does not teach controlling a robot.

Lam discloses a flight simulator ("flight simulator" in the abstract) comprising controlling a robot in response to operator input (e.g., navigation) commands (figure 1 depicts the robot; "In motion simulator systems, and especially in flight simulator motion systems, the sensation of motion is given by simulating forces acting on the users of the simulator to give the user the feeling of motion. Thus, the systems must take into account the type of motion which should be experienced by the user. That is, there will be different forces acting on the user when the aircraft is supposed to be banking than when the aircraft is supposed to be yawing" at column 1, line 25).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the operator input commands (e.g., navigational information) of Fant to control a robotic flight simulation platform as taught by Lam, in order to provide "the sensation of motion ... by simulating forces acting on the users of the simulator to give the user the feeling of motion" (Lam, column 1, line 26) thereby creating a more realistic flight simulation.

However, the Examiner has not specifically identified which part of Fant is relied upon (Section 7.6.6). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Sidoti does not expressly teach such “inertial navigation information” at “figure 1, numeral 15; ... at column 1, line 37”. “[A] directional gyro compass” is not an “inertial navigation” system, it conventionally provides directional information. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection is based upon references that are directed to different technologies.

- a) Fant is directed to a spatial transform image processing system;
- b) Sidoti is directed to a flight simulator; and
- c) Lam is directed to flight simulator motion systems.

However, the Examiner does not provide a proper showing of motivation for the combination thereof nor provide a proper showing of how these references could have been combined (e.g.; Sections 7.8.5, 7.8.6, and 7.8.8). Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection does not establish a proper teaching or suggestion in the prior art suitable to combine the references. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claims 551, 560 and 576; respectively:

551. A process comprising the acts of:
 storing computer instructions;
 generating inertial navigation information in response to the
 computer instructions;
 generating video camera information with a video camera; and
 controlling a robot in response to the computer instructions and
 in response to the video camera information.

560. A process comprising the acts of:
 storing computer instructions;
 generating inertial navigation information in response to the
 computer instructions;
 generating radar information; and
 controlling a robot in response to the computer instructions and
 in response to the radar information.

576. A process comprising the acts of:
 storing computer instructions;

generating inertial navigation information in response to the computer instructions;
 generating camera information with a camera;
 generating feedback information in response to the computer instructions and in response to the camera information; and
 controlling a robot in response to the computer instructions and in response to the camera information.

For example, the Examiner admits to not giving any weight to so-called “intended use [claim] limitations” (*see, e.g.*; Table 5.1) and the Examiner has apparently not given weight to “in response to” claim limitations (*see, e.g.*; Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (*e.g.*; Section 7.6.5).

7.8.9.19 The § 103 rejection over Fant and Lam

The Examiner states (instant Action at 179-180):

36. Claim 398, as well as its corresponding dependent claims, are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Fant (US 4,835,532 A) and Lam et al. (US 4,576,577 A).

Notes:

- Intended use limitations in the body of the claim are not given weight.
- The details of Fant as described above are incorporated herein by reference, and will not be repeated here.

While Fant teaches a flight simulator, where the operator has "controls for guiding or navigating it in any direction in, around and through the gaming area in the manner of free flight" at column 4, line 62), Fant does not teach controlling a robot.

Lam discloses a flight simulator ("flight simulator" in the abstract) comprising controlling a robot in response to operator input (*e.g.*, navigation) commands (figure 1 depicts the robot; "In motion simulator systems, and especially in flight simulator motion systems, the sensation of motion is given by simulating forces acting on the users of the simulator to give the user the feeling of motion. Thus, the systems must take into account the type of motion which should be experienced by the user. That is, there will be different forces acting on the user when the aircraft is supposed to be banking than when the aircraft is supposed to be yawing" at column 1, line 25).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the operator input commands (e.g., navigational information) of Fant to control a robotic flight simulation platform as taught by Lam, in order to provide "the sensation of motion ... by simulating forces acting on the users of the simulator to give the user the feeling of motion" (Lam, column 1, line 26) thereby creating a more realistic flight simulation.

However, the Examiner has not specifically identified which part of Fant is relied upon (Section 7.6.6). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the rejection is based upon references that are directed to different technologies.

- a) Fant is directed to a spatial transform image processing system; and
- b) Lam is directed to flight simulator motion systems.

However, the Examiner does not provide a proper showing of motivation for the combination thereof nor provide a proper showing of how these references could have been combined (e.g.; Sections 7.8.5, 7.8.6, and 7.8.8). Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection does not establish a proper teaching or suggestion in the prior art suitable to combine the references. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 398:

398. A process comprising the acts of:
 storing computer instructions;
 generating navigation information in response to the computer instructions;
 generating infra-red information with an infra-red sensor;
 generating feedback information in response to the computer instructions; and
 controlling a robot in response to the computer instructions and in response to the infra-red information.

For example, the Examiner admits to not giving any weight to so-called "intended use [claim] limitations" (*see, e.g.*; Table 5.1) and the Examiner has apparently not given weight to "in response to" claim

limitations (*see, e.g.*; Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (*e.g.*; Section 7.6.5).

7.8.9.20 The § 103 rejection over Meagher and Tucker

The Examiner states (instant Action at 180-181):

37. Claim 133, as well as its corresponding dependent claims, are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of by Meagher (US 4,694,404 A) and Tucker (US 4,546,433 A).

Notes:

- Intended use limitations in the body of the claim are not given weight.
- The details of Meagher as described above are incorporated herein by reference, and will not be repeated here.

Meagher does not teach generating and storing kernel weight information, and generating kernel filtered image information.

Tucker discloses an image processing system "from which information relating to prominent edges, abrupt discontinuities, and other visual outstanding features are to be extracted so that the remaining extraneous noise and less significant visual features ... can be discarded" at column 2, line 19. For this process, Tucker discloses a kernel filter having shaded weights ("weighting masks" at column 9, line 34; "two dimensional low pass filter with noise cleaning properties" at column 9, line 43).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the kernel filter with shaded weights as taught by Tucker, to filter and smooth the edges in the images of Meagher, and thereby provide a smoothed and cleaner version of the images whereby "the remaining extraneous noise and less significant visual features ... can be discarded" (Tucker, column 2, line 19) while at the same time providing "noise cleaning properties" (Tucker, column 9, line 43).

However, the Examiner has not specifically identified which part of Meagher is relied upon (Section 7.6.6). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, Tucker does not expressly teach such “a kernel filter” nor the multiplication related to a kernel filter for the weighting function. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection is based upon references that are directed to different technologies.

- a) Meagher is directed to high speed image generation of complex solid objects using octree encoding; and
- b) Tucker is directed to two dimensional array processing.

However, the Examiner does not provide a proper showing of motivation for the combination thereof nor provide a proper showing of how these references could have been combined (e.g.; Sections 7.8.5, 7.8.6, and 7.8.8). Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection does not establish a proper teaching or suggestion in the prior art suitable to combine the references. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 133:

133. A process comprising the acts of:
 storing computer instructions;
 generating X-ray image information; and
 generating kernel filtered image information in response to the
 X-ray image information and in response to the computer instructions.

For example, the Examiner admits to not giving any weight to so-called “intended use [claim] limitations” (*see, e.g.*; Table 5.1) and the Examiner has apparently not given weight to “in response to” claim limitations (*see, e.g.*; Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

7.8.9.21 The § 103 rejection over Meagher and Cleminson

The Examiner states (instant Action at 181-183):

38. Claim 169, as well as its corresponding dependent claims, are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of by Meagher (US 4,694,404 A) and Cleminson (US 4,675,829 A).

Notes:

- Intended use limitations in the body of the claim are not given weight.
- The details of Meagher as described above are incorporated herein by reference, and will not be repeated here.

Meagher does not teach generating artificial intelligence information.

Cleminson states, at column 1, lines 10-34:

"Artificial intelligence (AI) technology is a discipline with an ultimate goal of providing a machine that is capable of reasoning, making inferences and following rules in a manner believed to model the human mind. A great deal of theoretical work has been done in this discipline, and much remains to be done. Artificial intelligence theory is beginning to find applications because of the hope that its principles can be effectively applied to develop better computer software and to provide to relatively untrained users sophisticated computer power to solve practical problems such as to assist in the analysis of massive amounts of relatively unprocessed data to aid in decision-making processes.

As AI technology begins to demonstrate potential and practical uses, tools are needed to speed development of practical computational systems. AI specialists have developed a number of AI-dedicated computer languages to assist in this development. Among the languages are LISP and PROLOG. However, these languages are not particularly easy for either skilled AI researchers or minimally-trained user/programmers to use to develop sophisticated and complex knowledge bases necessary to solve the problems related to artificial intelligence applications.

Hence, tools are needed which are better suited to the requirements of both a minimally-trained knowledge base user and a skilled AI researcher."

It would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the artificial intelligence processing as described by Cleminson above, either in the software and/or hardware of Meagher's various processing modules, in order to: provide "a machine that is capable of reasoning, making inferences and following rules in a manner believed to model the human mind", and

"to develop better computer software and to provide to relatively untrained users sophisticated computer power to solve practical problems such as to assist in the analysis of massive amounts of relatively unprocessed data to aid in decision-making processes",

Thereby improving the speed and accuracy with which Meagher's processing modules make their respective decisions.

However, the Examiner has not specifically identified which part of Meagher is relied upon (Section 7.6.6). Further, the Examiner has not properly construed the claims (Sections 7.2.6 and 7.6.4). Hence, for each of these reasons, the instant rejection fails to establish a *prima facie* case.

Further, the rejection is based upon references that are directed to different technologies.

a) Meagher is directed to high speed image generation of complex solid objects using octree encoding; and

b) Cleminson is directed to knowledge-based systems.

However, the Examiner does not provide a proper showing of motivation for the combination thereof nor provide a proper showing of how these references could have been combined (e.g.; Sections 7.8.5, 7.8.6, and 7.8.8). Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the rejection does not establish a proper teaching or suggestion in the prior art suitable to combine the references. Hence, the instant rejection further fails to establish a *prima facie* case.

Further, the Examiner apparently gives no weight to important claim limitations. See, e.g.; Table 5.1 and Table 5.2. See also claim 169:

169. A process comprising the acts of:
storing computer instructions;
generating X-ray image information; and
generating artificial intelligence information in response to the X-ray image information and in response to the computer instructions.

For example, the Examiner admits to not giving any weight to so-called "intended use [claim] limitations" (*see, e.g.*; Table 5.1) and the Examiner has apparently not given weight to "in response to" claim limitations (*see, e.g.*; Table 5.2). Thus, this is an improper rejection and, for this reason alone, the instant rejection should be reversed (e.g.; Section 7.6.5).

7.9 CONCLUSION

The Appellant has established that the disclosure is adequate and meets the requirements of § 112. The Appellant has further established that the § 112 rejections violate the law of the Federal Circuit, are based upon erroneous and unsupported allegations, and do not establish a prima facie case. For each of these reasons, the § 112 rejections must be reversed.

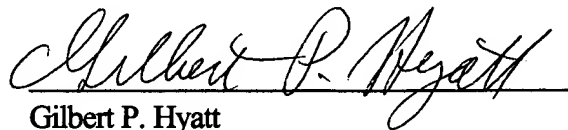
The Appellant has established that the claims of the instant application patentably distinguished the references. The Appellant has further established that the art rejections violate the law of the Federal Circuit and do not establish a prima facie case. For each of these reasons, the art rejections must be reversed.

Because the Examiner has failed to, and in fact cannot,⁴⁰⁹ establish a prima facie case to support the rejections, **the Appellant is entitled to a patent.**⁴¹⁰

CERTIFICATION OF MAILING BY EXPRESS MAIL: I hereby certify that this correspondence is being deposited with the United States Postal Service with Express Mail post office to addressee service under 37 CFR 1.10, postage prepaid, in an envelope addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 with the express mail label number EV 748457743 on March 8, 2006.

Dated: March 8, 2006

Respectfully submitted,



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⁴⁰⁹ The Examiner cannot establish a prima facie case because the claims find ample antecedent basis in the disclosure and because the references do not anticipate or render the claims obvious.

⁴¹⁰ In re Oetiker, 977 F.2d 1443, 24 USPQ2d 1443 at 1447 (Fed. Cir. 1992).



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

On re Application of)

GILBERT P. HYATT)

Group Art Unit: 2621

Serial No. 08/464,034)

Examiner: Brian Werner

Docket No. 751)

Filed: June 5, 1995)

For: IMPROVED IMAGE PROCESSING)
ARCHITECTURE)

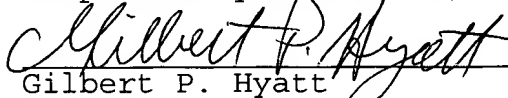
APPENDICIES AND EXHIBITS

Hon. Commissioner For Patents
P.O. Box 1450, Alexandria, VA 22313-1450

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8. CLAIMS APPENDIX

APPENDIX

105. A process comprising the acts of:
storing computer instructions;
generating camera image information; and
generating temporally interpolated image information in response to the camera image information and in response to the computer instructions.

106. A process comprising the acts of:
storing computer instructions;
generating infra-red image information; and
generating temporally interpolated image information in response to the infra-red image information and in response to the computer instructions.

107. A process comprising the acts of:
storing computer instructions;
generating radar image information; and
generating temporally interpolated image information in response to the radar image information and in response to the computer instructions.

108. A process comprising the acts of:
storing computer instructions;
generating tomographic image information; and
generating temporally interpolated image information in response to the tomographic image information and in response to the computer instructions.

109. A process comprising the acts of:
storing a prior 64-pixel block of image information, the prior 64-pixel block of image information representing a prior image;
storing a next 64-pixel block of image information, the next 64-pixel block of image information representing a next image;

.generating prior motion vector information in response to the prior 64-pixel block of image information;

generating next motion vector information in response to the next 64-pixel block of image information; and

generating temporally interpolated image information by temporally interpolating between the prior motion vector information and the next motion vector information in response to the prior 64-pixel block of image information and in response to the next 64-pixel block of image information.

110. A process as set forth in claim 109, further comprising the act of:

communicating output image information over an RF data link in response to the temporally interpolated image information.

111. A process as set forth in claim 533, further comprising the act of making a vehicle product in response to the process.

112. A process as set forth in claim 109, further comprising the acts of:

storing at least two digital bits of information in each of a plurality of multibit memory cells;

generating accessed digital information in response to the at least two digital bits of information stored in each of the plurality of multibit memory cells; and

generating the temporally interpolated image information in response to the accessed digital information.

113. A process comprising the acts of:

storing a frame of prior pixel image information, the frame of prior pixel image information representing a prior image;

.storing a frame of next pixel image information, the frame of next pixel image information representing a next image; and

generating subpixel change information having subpixel resolution by subtracting between the frame of prior pixel image information and the frame of next pixel image information.

114. A process as set forth in claim 113, further comprising the act of making a building product in response to the process.

115. A process comprising the acts of:

storing prior pixel image information, the prior pixel image information representing a prior image;

storing next pixel image information, the next pixel image information representing a next image; and

generating 64-pixel blocks of spatially interpolated image information in response to the prior pixel image information and in response to the next pixel image information.

116. A process comprising the acts of:

storing computer instructions;

generating sonar image information; and

generating temporally interpolated image information in response to the sonar image information and in response to the computer instructions.

117. A process comprising the acts of:

storing computer instructions;

generating X-ray image information; and

generating temporally interpolated image information in response to the X-ray image information and in response to the computer instructions.

.118. A process comprising the acts of:
storing computer instructions;
generating navigation information; and
generating temporally interpolated image information in response to the navigation information and in response to the computer instructions.

119. A system comprising:
an integrated circuit multibit memory having a plurality of multibit memory cells, each of the plurality of multibit memory cells storing at least two digital bits of information;
an integrated circuit multibit memory accessing circuit generating accessed digital information in response to the at least two digital bits of information stored in each of the plurality of multibit memory cells; and
a processor generating kernel filtered image information in response to the accessed digital information.

120. A process comprising the acts of:
storing at least two digital bits of information in each of a plurality of multibit memory cells;
generating accessed digital information in response to the at least two digital bits of information stored in each of the plurality of multibit memory cells; and
generating 64-pixel blocks of image information in response to the accessed digital information.

121. A system comprising:
a first memory storing a frame of prior pixel image information, the frame of prior pixel image information representing a prior image;
a second memory storing a frame of next pixel image information, the frame of next pixel image information representing a next image;
a prior vector circuit generating prior vector information in response to the frame of prior pixel image information;

.a next vector circuit generating next vector information in response to the frame of next pixel image information; and

a temporal interpolation processor generating a frame of temporally interpolated image information by temporally interpolating between the frame of prior pixel image information and the frame of next pixel image information in response to the prior vector information and in response to the next vector information.

122. A system as set forth in claim 121, further comprising:

an RF communication link communicating output image information in response to the frame of temporally interpolated image information.

123. A process comprising the acts of:

storing computer instructions;
generating camera image information; and
generating kernel filtered image information in response to the camera image information and in response to the computer instructions.

124. A process comprising the acts of:

storing computer instructions;
generating radar image information; and
generating kernel filtered image information in response to the radar image information and in response to the computer instructions.

125. A process comprising the acts of:

storing prior pixel image information representing a prior image;
storing next pixel image information representing a next image; and
generating temporally interpolated image information in response to the prior pixel image information and in response to the next pixel image information.

.126. A process comprising the acts of:
storing computer instructions;
generating tomographic image information; and
generating kernel filtered image information in response to the tomographic image information and in response to the computer instructions.

127. A process comprising the acts of:
storing prior pixel image information representing a prior image;
storing next pixel image information representing a next image; and
generating transformed image information in response to the prior pixel image information and in response to the next pixel image information.

128. A process comprising the acts of:
storing computer instructions;
generating processed information by executing the computer instructions with a stored program computer;
storing digital information in a charge coupled device memory;
generating memory output information by accessing the digital information stored in the charge coupled device memory in response to the computer instructions;
generating multiplexed image information in response to the computer instructions;
generating demultiplexed image information in response to the computer instructions;
generating associative information in response to the computer instructions;
generating VAX bus information in response to the computer instructions;
generating subpixel information in response to the computer instructions;
generating video disk information in response to the computer instructions;
storing first database information in a database memory;
generating accessed database information in response to the first database information and in response to the computer instructions;

.generating blocks of information in response to the computer instructions;
storing a frame of image information in an image memory;
generating accessed image information by accessing in response to the frame of image information stored in the image memory;
generating first image information in response to the computer instructions, the first image information representing a first perspective of an image;
generating second image information in response to the computer instructions, the second image information representing a second perspective of the image that is X-axis offset from the first perspective of the image; and
generating frequency domain information in response to the computer instructions.

129. A process as set forth in claim 127, further comprising the act of generating artificial intelligence information in response to the transformed image information.

130. A process as set forth in claim 125, further comprising the act of making a product in response to the process.

131. A process comprising the acts of:
storing computer instructions;
generating sonar image information; and
generating kernel filtered image information in response to the sonar image information and in response to the computer instructions.

132. A process as set forth in claim 128:
wherein the process is a display process, the display process further comprising the act of displaying an image in response to the computer instructions; and
wherein the database memory is a floppy disk mosaic database memory storing the first database information as first floppy disk mosaic database image information;
the process further comprising the acts of:

.storing the computer instructions as compiled Basic computer instructions;
generating the processed information by executing the computer instructions with the stored program computer implemented with an S100 stored program computer;
generating the accessed database information as accessed floppy disk mosaic database image information in response to the first floppy disk mosaic database image information and in response to the computer instructions;
generating the blocks of information as 64-pixel blocks of image information in response to the computer instructions;
storing the frame of image information as a two dimensional frame of 4096 64-pixel blocks of image information in the image memory;
generating the accessed image information as accessed 64-pixel blocks of image information in response to the two dimensional frame of 4096 64-pixel blocks of image information;
generating the first image information as first field channel interlaced image information in response to the computer instructions, the first field channel interlaced image information representing the first perspective of the image as the first field perspective of the image;
generating the second image information as second field channel interlaced image information in response to the computer instructions, the second field channel interlaced image information representing the second perspective of the image as the second field perspective of the image that is X-axis offset from the first field perspective of the image; and
generating the frequency domain information by Fourier transforming in response to the computer instructions.

133. A process comprising the acts of:

storing computer instructions;
generating X-ray image information; and
generating kernel filtered image information in response to the X-ray image information and in response to the computer instructions.

.134. A process as set forth in claim 128:

wherein the database memory is a mosaic database memory storing the first database information as first mosaic database image information;

the process further comprising the acts of:

generating scrolling information;

generating the accessed database information as accessed mosaic database image information in response to the first mosaic database image information, in response to the scrolling information, and in response to the computer instructions;

generating wrap-around information; and

writing the frame of image information into the image memory in response to the accessed mosaic database image information and in response to the wrap-around information.

135. A process comprising the acts of:

storing computer instructions;

generating television image information; and

generating kernel filtered image information in response to the television image information and in response to the computer instructions.

136. A process comprising the acts of:

storing computer instructions;

storing digital information in a charge coupled device memory;

generating memory output information by accessing the digital information stored in the charge coupled device memory in response to the computer instructions;

generating multiplexed image information in response to the computer instructions;

generating demultiplexed image information in response to the computer instructions;

generating associative information in response to the computer instructions;

generating VAX bus information in response to the computer instructions;

generating subpixel information in response to the computer instructions;

.generating video disk information in response to the computer instructions;
 generating first transformed image information in response to the computer instructions;
 generating second transformed image information in response to the computer instructions;
 generating weight information;
 generating third image information;
 generating weighted image information by filtering in response to the weight information, in response to the third image information, and in response to the computer instructions;
 generating scale factor information;
 generating fourth image information; and
 generating scaled image information in response to the scale factor information, in response to the fourth image information, and in response to the computer instructions.

137. A process comprising the acts of:
 storing computer instructions;
 generating camera image information; and
 generating pattern recognition information in response to the camera image information and in response to the computer instructions.

138. A process as set forth in claim 136, further comprising the acts of:
 storing a frame of image information in an image memory;
 generating the first transformed image information as Fourier transformed image information in response to the computer instructions;
 generating the second transformed image information as second rotational translational zoom transformed image information in response to the computer instructions;
 generating frequency domain information in response to the computer instructions;

.generating inverse transformed frequency domain information by inverse Fourier transforming in response to the computer instructions and in response to the frequency domain information;

generating the weight information as kernel weight information, the kernel weight information comprising a nine weight kernel of kernel weight information;

generating the weighted image information as kernel weighted image information by kernel filtering in response to the kernel weight information, in response to the third image information, and in response to the computer instructions;

generating the scale factor information as kernel normalization scale factor information; and

generating the scaled image information as kernel scaled normalization image information in response to the kernel normalization scale factor information, in response to the fourth image information, and in response to the computer instructions.

139. A process comprising the acts of:

storing computer instructions;

generating GPS navigation information; and

generating kernel filtered image information in response to the GPS navigation information and in response to the computer instructions.

140. A process comprising the acts of:

storing computer instructions;

storing digital information in a charge coupled device memory;

generating memory output information by accessing the digital information stored in the charge coupled device memory in response to the computer instructions;

generating multiplexed image information in response to the computer instructions;

generating demultiplexed image information in response to the computer instructions;

generating associative information in response to the computer instructions;

.generating VAX bus information in response to the computer instructions;
 generating subpixel information in response to the computer instructions;
 generating video disk information in response to the computer instructions;
 generating overlaid information in response to the computer instructions;
 generating undersampled information in response to the computer instructions;
 generating oversampled information in response to the computer instructions;
 generating spatially interpolated information in response to the computer
 instructions;
 generating temporally interpolated information in response to the computer
 instructions; and
 displaying an image with a display device in response to the computer
 instructions.

141. A system comprising:

a first memory storing prior pixel image information, the prior pixel image
 information representing a prior image;
 a second memory storing next pixel image information, the next pixel image
 information representing a next image;
 a prior vector circuit generating prior vector information in response to the prior
 pixel image information;
 a next vector circuit generating next vector information in response to the next
 pixel image information;
 a weight circuit generating weight information;
 a scale factor circuit generating scale factor information; and
 a weighting and scaling circuit generating scaled weighted image information in
 response to the prior vector information, in response to the next vector information, in response
 to the scale factor information, in response to the weight information, in response to the prior
 pixel image information, and in response to the next pixel image information.

.142. A system as set forth in claim 141, further comprising:
an RF communication link communicating output image information in response to the scaled weighted image information.

143. A process comprising the acts of:
storing computer instructions;
generating infra-red image information; and
generating pattern recognition information in response to the infra-red image information and in response to the computer instructions.

144. A process as set forth in claim 140:
wherein the process is a display process, the display process further comprising the act of displaying an image in response to the computer instructions; and
wherein the display device is a CRT display device displaying the image as a CRT image in response to the computer instructions;
the process further comprising the acts of:
generating graphic information in response to the computer instructions;
generating memory mapped image information in response to the computer instructions;
generating the overlaid information by overlaying the graphic information onto the memory mapped image information in response to the computer instructions;
generating the undersampled information as undersampled image information to spatially compress an image in response to the computer instructions;
generating the oversampled information as oversampled image information to spatially expand an image in response to the computer instructions;
generating the spatially interpolated information as spatially interpolated image information by spatially interpolating in between first spatial image information and second spatial image information in response to the computer instructions; and

.generating the temporally interpolated information as temporally interpolated image information by temporally interpolating in between first temporal image information and second temporal image information in response to the computer instructions.

145. A process comprising the acts of:

storing computer instructions;

generating tomographic image information; and

generating pattern recognition information in response to the tomographic image information and in response to the computer instructions.

146. A process comprising the acts of:

storing computer instructions;

storing digital information in a charge coupled device memory;

generating memory output information by accessing the digital information stored in the charge coupled device memory in response to the computer instructions;

generating multiplexed image information in response to the computer instructions;

generating demultiplexed image information in response to the computer instructions;

generating associative information in response to the computer instructions;

generating VAX bus information in response to the computer instructions;

generating subpixel information in response to the computer instructions;

generating video disk information in response to the computer instructions;

generating first channel display information in response to the computer instructions;

generating second channel display information in response to the computer instructions;

displaying a first channel image on a first display monitor in response to the computer instructions;

.displaying a second channel image on a second display monitor in response to the computer instructions;

generating data compressed image information in response to the computer instructions;

generating data decompressed image information in response to the computer instructions; and

generating Fourier transformed image information in response to the computer instructions.

147. A process comprising the acts of:

storing data compressed image information in a database memory; and

generating temporally interpolated image information in response to the data compressed image information.

148. A process comprising the acts of:

storing computer instructions;

generating tomographic image information; and

generating zoomed image information in response to the tomographic image information and in response to the computer instructions.

149. A process comprising the acts of:

storing computer instructions;

generating sonar image information; and

generating pattern recognition information in response to the sonar image information and in response to the computer instructions.

150. A process comprising the acts of:

storing computer instructions;

storing digital information in a charge coupled device memory;

.generating memory output information by accessing the digital information stored in the charge coupled device memory in response to the computer instructions;

generating multiplexed image information in response to the computer instructions;

generating demultiplexed image information in response to the computer instructions;

generating associative information in response to the computer instructions;

generating VAX bus information in response to the computer instructions;

generating subpixel information in response to the computer instructions;

generating video disk information in response to the computer instructions;

generating feedback image information in response to the computer instructions;

generating 64-pixel blocks of image information in response to the computer instructions;

generating anti-aliased image information in response to the computer instructions;

generating pattern recognition information in response to the computer instructions;

generating artificial intelligence information in response to the computer instructions;

communicating information over a data link in response to the computer instructions;

controlling motion of a machine in response to the computer instructions;

generating video image information in response to the computer instructions;

generating computer-aided manufacturing information in response to the computer instructions; and

generating computer-aided design image information in response to the computer instructions.

- .151. A process comprising the acts of:
 storing computer instructions;
 generating X-ray image information; and
 generating pattern recognition information in response to the X-ray image
 information and in response to the computer instructions.
152. A process comprising the acts of:
 storing computer instructions;
 storing digital information in a charge coupled device memory;
 generating memory output information by accessing the digital information stored
 in the charge coupled device memory in response to the computer instructions;
 generating multiplexed image information in response to the computer
 instructions;
 generating demultiplexed image information in response to the computer
 instructions;
 generating associative information in response to the computer instructions;
 generating VAX bus information in response to the computer instructions;
 generating subpixel information in response to the computer instructions;
 generating video disk information in response to the computer instructions;
 generating temporal interpolation image information in response to the computer
 instructions;
 generating undersampled image information in response to the computer
 instructions;
 generating rotated image information in response to the computer instructions;
 generating translated image information in response to the computer instructions;
 generating spatially expanded image information in response to the computer
 instructions;
 generating spatially compressed image information in response to the computer
 instructions; and
 generating warped image information in response to the computer instructions.

- .153. A process comprising the acts of:
- storing computer instructions;
 - generating television image information; and
 - generating pattern recognition information in response to the television image information and in response to the computer instructions.
154. A process comprising the acts of:
- storing computer instructions;
 - storing digital information in a charge coupled device memory;
 - generating memory output information by accessing the digital information stored in the charge coupled device memory in response to the computer instructions;
 - generating multiplexed image information in response to the computer instructions;
 - generating demultiplexed image information in response to the computer instructions;
 - generating associative information in response to the computer instructions;
 - generating VAX bus information in response to the computer instructions;
 - generating subpixel information in response to the computer instructions;
 - generating video disk information in response to the computer instructions;
 - generating three dimensional perspective image information in response to the computer instructions;
 - generating spatially transformed image information by mapping from memory mapped image information stored in an image memory to a display media in response to the computer instructions;
 - generating wrapped-around vector information in response to the computer instructions;
 - generating a plurality of channels of image information in response to the computer instructions;
 - generating classification information in response to the computer instructions;

.generating computer-aided manufacturing information in response to the computer instructions;

generating tomographic information in response to the computer instructions;

generating polar information in response to the computer instructions; and

generating windowed image information in response to the computer instructions.

155. A process comprising the acts of:

storing computer instructions;

storing digital information in a charge coupled device memory;

generating memory output information by accessing the digital information stored in the charge coupled device memory in response to the computer instructions;

generating multiplexed image information in response to the computer instructions;

generating demultiplexed image information in response to the computer instructions;

generating associative information in response to the computer instructions;

generating VAX bus information in response to the computer instructions;

generating subpixel information in response to the computer instructions;

generating video disk information in response to the computer instructions;

generating video camera image information in response to the computer instructions;

generating infra-red image information in response to the computer instructions;

generating radar image information in response to the computer instructions;

generating navigation information in response to the computer instructions;

storing relational database image information in a relational database memory;

storing rectangular mosaic image information in the relational database memory;

generating relational database management information in response to the computer instructions; and

.generating accessed database information in response to the computer instructions, in response to the relational database image information, and in response to the relational database management information.

156. A process comprising the acts of:

- storing computer instructions;
- storing digital information in a charge coupled device memory;
- generating memory output information by accessing the digital information stored in the charge coupled device memory in response to the computer instructions;
- generating multiplexed image information in response to the computer instructions;
- generating demultiplexed image information in response to the computer instructions;
- generating associative information in response to the computer instructions;
- generating VAX bus information in response to the computer instructions;
- generating subpixel information in response to the computer instructions;
- generating video disk information in response to the computer instructions;
- generating process control image information in response to the computer instructions;
- controlling a process in response to the process control image information and in response to the computer instructions;
- controlling a machine in response to the computer instructions;
- generating graphic information in response to the computer instructions;
- generating memory mapped image information in response to the computer instructions;
- generating overlaid image information in response to the computer instructions, in response to the graphic information, and in response to the memory mapped image information;

.generating kernel filtered image information in response to the computer instructions; and

generating kernel scaled image information in response to the computer instructions.

157. A process comprising the acts of:

storing computer instructions;

generating navigation information; and

generating pattern recognition information in response to the navigation information and in response to the computer instructions.

158. A process comprising the acts of:

storing computer instructions;

storing digital information in a charge coupled device memory;

generating memory output information by accessing the digital information stored in the charge coupled device memory in response to the computer instructions;

generating multiplexed image information in response to the computer instructions;

generating demultiplexed image information in response to the computer instructions;

generating associative information in response to the computer instructions;

generating VAX bus information in response to the computer instructions;

generating subpixel information in response to the computer instructions;

generating video disk information in response to the computer instructions;

storing first stored information in a first memory;

storing second stored information in a second memory;

storing third stored information in a third memory;

generating first processed information with a first processor in response to the computer instructions and in response to the first stored information;

.generating second processed information with a second processor in response to the computer instructions and in response to the second stored information; and

generating third processed information with a third processor in response to the computer instructions and in response to the third stored information.

159. A process comprising the acts of:

storing computer instructions;

generating camera image information; and

generating artificial intelligence information in response to the camera image information and in response to the computer instructions.

160. A process as set forth in claim 158, further comprising the acts of:

storing the first stored information in a first memory portion of a shared memory;

storing the second stored information in a second memory portion of the shared memory;

storing the third stored information in a third memory portion of the shared memory;

generating the first processed information with the first processor included in a time shared processor in response to the computer instructions and in response to the first stored information;

generating the second processed information with the second processor included in the time shared processor in response to the computer instructions and in response to the second stored information; and

generating the third processed information with the third processor included in the time shared processor in response to the computer instructions and in response to the third stored information.

- .161. A process comprising the acts of:
- storing computer instructions;
 - generating infra-red image information; and
 - generating artificial intelligence information in response to the infra-red image information and in response to the computer instructions.
162. A process as set forth in claim 158, further comprising the acts of:
- generating television display information in response to the computer instructions;
 - displaying a television image in response to the television display information and in response to the computer instructions;
 - generating service information in response to the computer instructions; and
 - displaying a service image in response to the service information and in response to the computer instructions.
163. A process comprising the acts of:
- storing computer instructions;
 - generating radar image information; and
 - generating artificial intelligence information in response to the radar image information and in response to the computer instructions.
164. A process as set forth in claim 158, further comprising the acts of:
- storing training information;
 - displaying a training image in response to the training information and in response to the computer instructions;
 - storing television network information; and
 - operating a television network in response to the television network information and in response to the computer instructions.

.165. A process comprising the acts of:
storing computer instructions;
generating tomographic image information; and
generating artificial intelligence information in response to the tomographic image information and in response to the computer instructions.

166. A process comprising the acts of:
storing computer instructions;
generating sonar image information; and
generating zoomed image information in response to the sonar image information and in response to the computer instructions.

167. A process comprising the acts of:
storing computer instructions;
generating sonar image information; and
generating artificial intelligence information in response to the sonar image information and in response to the computer instructions.

168. A process as set forth in claim 158, further comprising the acts of:
storing business information;
displaying a business image in response to the business information and in response to the computer instructions;
making a business decision in response to the business information and in response to the computer instructions;
storing disk information in a disk memory; and
generating accessed information by accessing the disk information stored in the disk memory in response to the computer instructions.

- .169. A process comprising the acts of:
- storing computer instructions;
 - generating X-ray image information; and
 - generating artificial intelligence information in response to the X-ray image information and in response to the computer instructions.
170. A process as set forth in claim 158, further comprising the acts of:
- storing DVD information in a DVD memory; and
 - generating accessed information by accessing the DVD information stored in the DVD memory in response to the computer instructions.
171. A process comprising the acts of:
- storing prior pixel image information, the prior pixel image information representing a prior image;
 - storing next pixel image information, the next pixel image information representing a next image;
 - generating prior motion vector information in response to the prior pixel image information;
 - generating next motion vector information in response to the next pixel image information;
 - generating 64-pixel blocks of spatially interpolated image information in response to the prior motion vector information, in response to the next motion vector information, in response to the prior pixel image information, and in response to the next pixel image information; and
 - generating transformed image information in response to the 64-pixel blocks of spatially interpolated image information, in response to the prior pixel image information, and in response to the next pixel image information.

.172. A process as set forth in claim 171, further comprising the act of:
communicating output image information over an RF data link in response to the transformed image information.

173. A process comprising the acts of:
storing computer instructions;
generating X-ray image information; and
generating zoomed image information in response to the X-ray image information and in response to the computer instructions.

187. A process comprising the acts of:
storing prior pixel image information, the prior pixel image information representing a prior image;
storing next pixel image information, the next pixel image information representing a next image;
generating prior vector information in response to the prior pixel image information;
generating next vector information in response to the next pixel image information; and
generating 64-pixel blocks of temporally interpolated image information in response to the prior vector information, in response to the next vector information, in response to the prior pixel image information, and in response to the next pixel image information.

188. A process comprising the acts of:
storing computer instructions;
generating navigation information in response to the computer instructions;
generating video camera information with a video camera;
generating feedback information in response to the computer instructions and in response to the video camera information; and

.generating zoomed image information in response to the computer instructions and in response to the video camera information.

189. A process comprising the acts of:
storing computer instructions;
generating television image information; and
generating zoomed image information in response to the television image information and in response to the computer instructions.

190. A process comprising the acts of:
storing computer instructions;
generating inertial navigation information in response to the computer instructions;
generating radar information; and
inputting database information into a database memory in response to the computer instructions and in response to the radar information.

191. A process as set forth in claim 158, further comprising the acts of:
storing digital video disk information in a digital video disk memory; and
generating accessed information by accessing the digital video disk information stored in the digital video disk memory in response to the computer instructions.

192. A process as set forth in claim 158, further comprising the acts of:
generating animation information in response to the computer instructions;
displaying an animated image in response to the animation information;
storing repair information; and
displaying a repair image in response to the repair information and in response to the computer instructions.

.193. A process comprising the acts of:
storing computer instructions;
generating television image information; and
generating artificial intelligence information in response to the television image information and in response to the computer instructions.

194. A process as set forth in claim 158, further comprising the acts of:
generating game information in response to the computer instructions;
displaying a game image in response to the game information and in response to the computer instructions;
storing airline information;
displaying an airline image in response to the airline information and in response to the computer instructions;
storing real estate information; and
displaying a real estate image in response to the real estate information and in response to the computer instructions.

195. A process comprising the acts of:
generating data compressed image information;
storing weight information;
storing scale factor information;
generating scaled weighted image information in response to the weight information, in response to the scale factor information, and in response to the data compressed image information;
generating transformed image information in response to the scaled weighted image information; and
generating temporally interpolated image information in response to the transformed image information.

- .196. A process comprising the acts of:
storing computer instructions;
generating GPS navigation information; and
generating zoomed image information in response to the GPS navigation information and in response to the computer instructions.
197. A process comprising the acts of:
storing computer instructions;
generating camera image information; and
generating graphic overlaid image information in response to the camera image information and in response to the computer instructions.
198. A process comprising the acts of:
storing pixel image information in a memory;
generating subpixel difference image information having subpixel resolution in response to the pixel image information and in response to feedback information; and
generating the feedback information in response to the subpixel difference image information.
199. A process as set forth in claim 198, further comprising the act of:
communicating output image information over an RF data link in response to the pixel image information.
200. A process as set forth in claim 198, further comprising the acts of:
generating data compressed image information in response to the pixel image information;
storing weight information;
storing scale factor information;

.generating scaled weighted image information in response to the weight information, in response to the scale factor information, and in response to the data compressed image information;

generating transformed image information in response to the scaled weighted image information;

generating spatially interpolated image information in response to the transformed image information;

generating temporally interpolated image information in response to the spatially interpolated image information; and

generating the feedback image information in response to the temporally interpolated image information.

201. A process comprising the acts of:

storing computer instructions;

generating video camera information with a video camera;

generating translated image information in response to the computer instructions and in response to the video camera information; and

loading database information into a database memory in response to the computer instructions and in response to the video camera information.

202. A process as set forth in claim 158, further comprising the acts of:

generating computer aided design information in response to the computer instructions;

displaying a computer aided design image in response to the computer aided design information and in response to the computer instructions;

making a product in response to the computer aided design information and in response to the computer instructions;

storing vehicular information;

displaying a vehicular image in response to the vehicular information and in response to the computer instructions; and

.making a vehicle in response to the vehicular information and in response to the computer instructions.

203. A process comprising the acts of:
storing computer instructions;
generating infra-red image information; and
generating graphic overlaid image information in response to the infra-red image information and in response to the computer instructions.

204. A process comprising the acts of:
storing computer instructions;
generating camera image information; and
generating warped image information in response to the camera image information and in response to the computer instructions.

205. A process as set forth in claim 158, further comprising the acts of:
generating computer aided design information in response to the computer instructions;
displaying a computer aided design image in response to the computer aided design information and in response to the computer instructions;
making a product in response to the computer aided design information and in response to the computer instructions;
storing architectural information;
displaying an architectural image in response to the architectural information and in response to the computer instructions; and
making an architecture in response to the architectural information and in response to the computer instructions.

- .206. A process comprising the acts of:
storing computer instructions;
generating radar image information; and
generating graphic overlaid image information in response to the radar image information and in response to the computer instructions.
207. A process comprising the acts of:
storing at least two digital bits of information in each of a plurality of multibit memory cells;
generating accessed digital information in response to the at least two digital bits of information stored in each of the plurality of multibit memory cells; and
generating 64-pixel blocks of image information in response to the accessed digital information.
208. A process as set forth in claim 158, further comprising the acts of:
generating computer aided design information in response to the computer instructions;
displaying a computer aided design image in response to the computer aided design information and in response to the computer instructions;
making a product in response to the computer aided design information and in response to the computer instructions;
storing integrated circuit process information;
displaying an integrated circuit process image in response to the integrated circuit process information and in response to the computer instructions; and
making an integrated circuit in response to the integrated circuit process information and in response to the computer instructions.

.209. A process comprising the acts of:

- storing prior pixel image information, the prior pixel image information representing a prior image;
- storing next pixel image information, the next pixel image information representing a next image;
- generating prior motion vector information in response to the prior pixel image information;
- generating next motion vector information in response to the next pixel image information; and
- generating 64-pixel blocks of temporally interpolated image information in response to the prior motion vector information, in response to the next motion vector information, in response to the prior pixel image information, and in response to the next pixel image information.

210. A process as set forth in claim 158, further comprising the acts of:

- generating seismic information in response to the computer instructions;
- exploring for oil in response to the seismic information; and
- exploring for minerals in response to the seismic information.

211. A process comprising the acts of:

- generating data compressed 64-pixel blocks of image information;
- storing weight information;
- storing scale factor information; and
- generating 64-pixel blocks of scaled weighted image information in response to the weight information, in response to the scale factor information, and in response to the data compressed 64-pixel blocks of image information.

- .212. A process comprising the acts of:
storing computer instructions;
generating infra-red image information; and
generating warped image information in response to the infra-red image information and in response to the computer instructions.
213. A process as set forth in claim 158, further comprising the acts of:
generating communication information in response to the computer instructions;
and
communicating data link information to a remote location over a data link in response to the communication information.
214. A process comprising the acts of:
storing computer instructions;
generating tomographic image information; and
generating graphic overlaid image information in response to the tomographic image information and in response to the computer instructions.
215. A process comprising the acts of:
storing computer instructions;
generating radar image information; and
generating warped image information in response to the radar image information and in response to the computer instructions.
216. A process as set forth in claim 215, further comprising the acts of:
generating second radar image information; and
generating the warped image information in response to the second radar image information and in response to the computer instructions.

- .217. A process comprising the acts of:
storing computer instructions;
generating X-ray image information; and
generating graphic overlaid image information in response to the X-ray image information and in response to the computer instructions.
218. A process comprising the acts of:
storing computer instructions;
generating tomographic image information; and
generating warped image information in response to the tomographic image information and in response to the computer instructions.
219. A process comprising the acts of:
generating data compressed image information;
generating scaled weighted image information in response to the data compressed image information;
generating transformed image information in response to the scaled weighted image information; and
generating feedback image information in response to the transformed image information.
220. A process as set forth in claim 219, further comprising the act of:
communicating data link image information over an RF data link in response to the transformed image information.
221. A process as set forth in claim 215, further comprising the acts of:
generating camera image information; and
generating the warped image information in response to the camera image information and in response to the computer instructions.

.222. A process as set forth in claim 215, further comprising the acts of:
generating infra-red image information; and
generating the warped image information in response to the infra-red image information and in response to the computer instructions.

223. A process comprising the acts of:
storing prior pixel image information representing a prior image;
storing next pixel image information representing a next image;
generating subpixel vector change information having subpixel resolution in response to the prior pixel image information and in response to the next pixel image information; and
generating transformed image information in response to the prior pixel image information and in response to the next pixel image information.

224. A process as set forth in claim 105, further comprising the acts of:
generating second camera image information; and
generating the temporally interpolated image information in response to the second camera image information and in response to the computer instructions.

225. A process as set forth in claim 223, further comprising the acts of:
generating data compressed image information in response to the transformed image information;
storing scale factor information;
generating scaled image information in response to the scale factor information and in response to the data compressed image information; and
generating the prior pixel image information in response to the scaled image information.

.226. A process comprising the acts of:
storing computer instructions;
generating sonar image information; and
generating warped image information in response to the sonar image information
and in response to the computer instructions.

227. A process as set forth in claim 105, further comprising the acts of:
generating infra-red image information; and
generating the temporally interpolated image information in response to the infra-
red image information and in response to the computer instructions.

228. A process comprising the acts of:
storing computer instructions;
generating television image information; and
generating graphic overlaid image information in response to the television image
information and in response to the computer instructions.

229. A process comprising the acts of:
storing computer instructions;
generating X-ray image information; and
generating warped image information in response to the X-ray image information
and in response to the computer instructions.

230. A process as set forth in claim 106, further comprising the acts of:
generating second infra-red image information; and
generating the temporally interpolated image information in response to the
second infra-red image information and in response to the computer instructions.

- .231. A process comprising the acts of:
storing computer instructions;
generating navigation information; and
generating graphic overlaid image information in response to the navigation information and in response to the computer instructions.
232. A process comprising the acts of:
storing pixel image information;
generating 64-pixel blocks of image information in response to the pixel image information;
generating delta subpixel information having subpixel resolution in response to the pixel image information and in response to feedback information; and
generating the feedback information in response to the delta subpixel information.
233. A process as set forth in claim 232, further comprising the act of:
communicating data link image information over an RF data link in response to the delta subpixel information.
234. A process as set forth in claim 223, further comprising the acts of:
generating data compressed image information in response to the transformed image information;
generating spatially interpolated image information in response to the data compressed image information;
generating temporally interpolated image information in response to the spatially interpolated image information; and
generating the prior pixel image information in response to the temporally interpolated image information.

- .235. A process comprising the acts of:
- storing prior pixel image information representing a prior image;
 - storing next pixel image information representing a next image;
 - generating prior motion vector information in response to the prior pixel image information;
 - generating next motion vector information in response to the next pixel image information; and
 - generating multiplexed image information in response to the prior pixel image information, in response to the next pixel image information, in response to the prior motion vector information, and in response to the next motion vector information.
236. A process as set forth in claim 235, further comprising the act of:
- communicating data link image information over an RF data link in response to the multiplexed image information.
237. A process as set forth in claim 235, further comprising the acts of:
- storing weight information;
 - storing scale factor information;
 - generating scaled weighted image information in response to the weight information, in response to the scale factor information, and in response to the multiplexed image information; and
 - generating the prior pixel image information in response to the scaled weighted image information.
238. A process comprising the acts of:
- storing a frame of prior pixel image information representing a prior image;
 - storing a frame of next pixel image information representing a next image;
 - generating subpixel vector change information having subpixel resolution in response to the frame of prior pixel image information and in response to the frame of next pixel image information;

.generating weight information; and
generating weighted image information in response to the frame of prior pixel image information, in response to the frame of next pixel image information, and in response to the weight information.

239. A process as set forth in claim 238, further comprising the act of:
communicating output image information over an RF data link in response to the weighted image information.

240. A process as set forth in claim 238, further comprising the acts of:
generating spatially interpolated image information in response to the weighted image information;
generating temporally interpolated image information in response to the spatially interpolated image information; and
generating the frame of prior pixel image information in response to the temporally interpolated image information.

241. A process comprising the acts of:
storing prior pixel image information representing a prior image;
storing next pixel image information representing a next image;
generating weight information;
generating scale factor information;
writing weight input information into a memory in response to the weight information;
storing the weight input information in the memory; and
generating scaled weighted image information in response to the prior pixel image information, in response to the next pixel image information, in response to the scale factor information, and in response to the weight input information.

.242. A process as set forth in claim 241, further comprising the act of:
communicating output image information over an RF data link in response to the scaled weighted image information.

243. A process as set forth in claim 241, further comprising the acts of:
generating spatially interpolated image information in response to the scaled weighted image information;
generating temporally interpolated image information in response to the spatially interpolated image information; and
generating the prior pixel image information in response to the temporally interpolated image information.

244. A process comprising the acts of:
storing a prior 64-pixel block of pixel image information;
storing a next 64-pixel block of pixel image information; and
generating a temporally interpolated 64-pixel block of image information by temporally interpolating between the prior 64-pixel block of pixel image information and the next 64-pixel block of pixel image information.

245. A process as set forth in claim 244, further comprising the act of:
communicating output image information over an RF data link in response to the temporally interpolated 64-pixel block of image information.

246. A process as set forth in claim 244, further comprising the acts of:
storing weight information;
storing scale factor information;
generating a 64-pixel block of scaled weighted image information in response to the weight information, in response to the scale factor information, and in response to the temporally interpolated 64-pixel block of image information; and

.generating the prior 64-pixel block of pixel image information in response to the 64-pixel block of scaled weighted image information.

247. A process as set forth in claim 244, further comprising the acts of:
generating a spatially interpolated 64-pixel block of image information in response to the temporally interpolated 64-pixel block of image information;
generating a second temporally interpolated 64-pixel block of image information in response to the spatially interpolated 64-pixel block of image information; and
generating the prior 64-pixel block of pixel image information in response to the second temporally interpolated 64-pixel block of image information.

248. A system as set forth in claim 105, further comprising the acts of:
generating radar image information; and
generating the temporally interpolated image information in response to the radar image information and in response to the computer instructions.

249. A process comprising the acts of:
storing computer instructions;
generating television image information; and
generating warped image information in response to the television image information and in response to the computer instructions.

250. A process as set forth in claim 106, further comprising the acts of:
generating radar image information; and
generating the temporally interpolated image information in response to the radar image information and in response to the computer instructions.

- .251. A process as set forth in claim 106, further comprising the acts of:
generating camera image information; and
generating the temporally interpolated image information in response to the camera image information and in response to the computer instructions.
252. A process comprising the acts of:
storing computer instructions;
generating GPS navigation information; and
generating warped image information in response to the GPS navigation information and in response to the computer instructions.
253. A process as set forth in claim 123, further comprising the acts of:
generating second camera image information; and
generating the kernel filtered image information in response to the second camera image information and in response to the computer instructions.
254. A process as set forth in claim 123, further comprising the acts of:
generating infra-red image information; and
generating the kernel filtered image information in response to the infra-red image information and in response to the computer instructions.
255. A process comprising the acts of:
storing computer instructions;
generating infra-red image information; and
generating translated rotated image information in response to the infra-red image information and in response to the computer instructions.

256. A process as set forth in claim 255, further comprising the acts of:
generating second infra-red image information; and
generating the translated rotated image information in response to the second
infra-red image information and in response to the computer instructions.

257. A process as set forth in claim 255, further comprising the acts of:
generating radar image information; and
generating the translated rotated image information in response to the radar
image information and in response to the computer instructions.

258. A process comprising the acts of:
storing computer instructions;
generating inertial navigation information in response to the computer
instructions;
generating radar information; and
generating feedback information in response to the computer instructions and in
response to the radar information.

259. A process as set forth in claim 258, further comprising the act of:
communicating data link image information over an RF data link in response to
the radar information.

260. A process as set forth in claim 258, further comprising the acts of:
generating a data compressed frame of image information in response to the radar
information.

261. A process comprising the acts of:
storing prior pixel image information representing a prior image;
storing next pixel image information representing a next image;

.generating subpixel vector change information having subpixel resolution in response to the prior pixel image information and in response to the next pixel image information; and

generating transformed image information in response to the prior pixel image information and in response to the next pixel image information.

262. A process as set forth in claim 261, further comprising the act of:

communicating output image information over an RF data link in response to the transformed image information.

263. A process as set forth in claim 261, further comprising the acts of:

generating data compressed image information in response to the transformed image information;

generating second transformed image information in response to the data compressed image information; and

generating the prior pixel image information in response to the second transformed image information.

264. A process comprising the acts of:

storing computer instructions;

generating radar image information; and

generating translated rotated image information in response to the radar image information and in response to the computer instructions.

265. A process as set forth in claim 264, further comprising the acts of:

generating second radar image information; and

generating the translated rotated image information in response to the second radar image information and in response to the computer instructions.

.266. A system as set forth in claim 123, further comprising the acts of:
generating radar image information; and
generating the kernel filtered image information in response to the radar image information and in response to the computer instructions.

267. A process comprising the acts of:
storing computer instructions;
generating tomographic image information; and
generating translated rotated image information in response to the tomographic image information and in response to the computer instructions.

268. A process as set forth in claim 264, further comprising the acts of:
generating camera image information; and
generating the translated rotated image information in response to the camera image information and in response to the computer instructions.

269. A process as set forth in claim 264, further comprising the acts of:
generating infra-red image information; and
generating the translated rotated image information in response to the infra-red image information and in response to the computer instructions.

270. A process comprising the acts of:
storing pixel image information in a memory;
generating subpixel difference information having subpixel resolution by subtracting in response to the pixel image information and in response to feedback information;
generating transformed image information in response to the pixel image information;
generating weight information;
generating scale factor information;

.generating scaled weighted image information in response to the transformed image information, in response to the scale factor information, and in response to the weight information; and

generating the feedback information in response to the scaled weighted image information.

271. A process as set forth in claim 270, further comprising the act of:

communicating output image information over an RF data link in response to the scaled weighted image information.

272. A process as set forth in claim 270, further comprising the acts of:

generating data compressed image information in response to the transformed image information;

generating the scaled weighted image information in response to the weight information, in response to the scale factor information, and in response to the data compressed image information;

generating second transformed image information in response to the scaled weighted image information;

generating spatially interpolated image information in response to the second transformed image information;

generating temporally interpolated image information in response to the spatially interpolated image information; and

generating the feedback information in response to the temporally interpolated image information.

273. A process comprising the acts of:

storing prior pixel image information representing a prior image;

storing next pixel image information representing a next image;

generating 64-pixel blocks of spatially interpolated image information in response to the prior pixel image information and in response to the next pixel image information;

.generating transformed image information in response to the 64-pixel blocks of spatially interpolated image information, in response to the prior pixel image information, and in response to the next pixel image information;

generating weight information;

generating scale factor information;

writing weight input information into a memory in response to the weight information;

storing the weight input information in the memory; and

generating scaled weighted image information in response to the transformed image information, in response to the scale factor information, and in response to the weight input information stored in the memory.

274. A process comprising the acts of:

storing computer instructions;

generating GPS navigation information in response to the computer instructions;

generating radar information; and

generating artificial intelligence information in response to the computer instructions and in response to the radar information.

275. A process as set forth in claim 273, further comprising the acts of:

generating data compressed image information in response to the scaled weighted image information;

generating second scaled weighted image information in response to the weight information, in response to the scale factor information, and in response to the data compressed image information;

generating second transformed image information in response to the scaled weighted image information;

generating 64-pixel blocks of second spatially interpolated image information in response to the second transformed image information;

.generating 64-pixel blocks of temporally interpolated image information in response to the 64-pixel blocks of second spatially interpolated image information; and
generating the prior pixel image information in response to the 64-pixel blocks of temporally interpolated image information.

276. A process comprising the acts of:
storing computer instructions;
generating inertial navigation information in response to the computer instructions;
generating radar information;
generating overlaid graphics information in response to the computer instructions and in response to the radar information; and
generating temporally interpolated image information in response to the radar information.

277. A process as set forth in claim 276, further comprising the act of:
communicating data link image information over an RF data link in response to the temporally interpolated image information.

278. A process as set forth in claim 137, further comprising the acts of:
generating second camera image information; and
generating the pattern recognition information in response to the second camera image information and in response to the computer instructions.

279. A process comprising the acts of:
storing prior pixel image information representing a prior image;
storing next pixel image information representing a next image;
generating prior motion vector information in response to the prior pixel image information;

.generating next motion vector information in response to the next pixel image information;

generating 64-pixel blocks of weighted image information in response to the prior pixel image information, in response to the next pixel image information, in response to the prior motion vector information, and in response to the next motion vector information; and

generating transformed image information in response to the 64-pixel blocks of weighted image information, in response to the prior pixel image information, and in response to the next pixel image information.

280. A process as set forth in claim 279, further comprising the act of:

communicating output image information over an RF data link in response to the transformed image information.

281. A process as set forth in claim 279, further comprising the acts of:

storing weight information;

storing scale factor information;

generating scaled weighted image information in response to the weight information, in response to the scale factor information, and in response to the transformed image information;

generating second transformed image information in response to the scaled weighted image information;

generating spatially interpolated image information in response to the second transformed image information;

generating temporally interpolated image information in response to the spatially interpolated image information; and

generating the prior pixel image information in response to the temporally interpolated image information.

.301. A process comprising the acts of: storing computer instructions;
generating sonar image information; and
generating translated rotated image information in response to the sonar image information and in response to the computer instructions.

380. A system comprising:
memory means for storing pixel image information;
means for generating weight information;
means for generating scale factor information; and
means for generating scaled weighted image information in response to the pixel image information stored in the memory means, in response to the scale factor information, and in response to the weight information.

381. A system comprising:
memory means for storing a prior 64-pixel block of image information;
memory means for storing a next 64-pixel block of image information; and
means for generating a plurality of temporally interpolated 64-pixel blocks of image information between the prior 64-pixel block of image information and the next 64-pixel block of image information.

382. A system comprising:
memory means for storing first image information;
means for generating spatially interpolated image information in response to the first image information stored in the memory means;
means for generating subpixel difference image information having subpixel resolution by subtracting in response to the first image information stored in the memory means and in response to feedback information;
means for generating weight information;
weight memory means;

.means for writing weight input information into the weight memory means in response to the weight information, the weight memory means storing the weight input information;

means for generating weighted image information in response to the weight input information stored in the weight memory means and in response to the spatially interpolated image information; and

means for generating the feedback information in response to the weighted image information.

383. A system comprising:

memory means for storing a prior 64-pixel block of image information;

memory means for storing a next 64-pixel block of image information;

means for generating a first temporally interpolated 64-pixel block of image information by temporally interpolating between the prior 64-pixel block of image information and the next 64-pixel block of image information;

means for generating a second temporally interpolated 64-pixel block of image information by temporally interpolating between the prior 64-pixel block of image information and the next 64-pixel block of image information;

means for generating a third temporally interpolated 64-pixel block of image information by temporally interpolating between the prior 64-pixel block of image information and the next 64-pixel block of image information;

means for generating first transformed image information in response to the first temporally interpolated 64-pixel block of image information;

means for generating second transformed image information in response to the second temporally interpolated 64-pixel block of image information; and

means for generating third transformed image information in response to the third temporally interpolated 64-pixel block of image information.

- .385. A process comprising the acts of:
storing computer instructions;
generating X-ray image information; and
generating translated rotated image information in response to the X-ray image information and in response to the computer instructions.
386. A process as set forth in claim 137, further comprising the acts of:
generating infra-red image information; and
generating the pattern recognition information in response to the infra-red image information and in response to the computer instructions.
387. A process as set forth in claim 385 137, further comprising the acts of:
generating radar image information; and
generating the pattern recognition information in response to the radar image information and in response to the computer instructions.
388. A process comprising the acts of:
storing computer instructions;
generating navigation information in response to the computer instructions;
generating camera information with a camera; and
generating rotated image information in response to the computer instructions and in response to the camera information.
389. A process as set forth in claim 109,
wherein the prior motion vector information includes prior frame horizontal-axis motion vector information and prior frame vertical-axis motion vector information; and
wherein the next motion vector information includes next frame horizontal-axis motion vector information and next frame vertical-axis motion vector information.

.390. A process comprising the acts of:

- storing a frame of pixel image information in a memory;
- generating spatially interpolated image information in response to the frame of pixel image information and in response to feedback information;
- generating weight information;
- generating scale factor information;
- generating scaled weighted image information in response to the spatially interpolated image information, in response to the weight information, and in response to the scale factor information;
- generating reduced resolution image information in response to the scaled weighted image information; and
- generating the feedback information in response to the reduced resolution image information.

391. A process as set forth in claim 390, further comprising the acts of:

- generating data compressed image information in response to the reduced resolution image information;
- generating the scaled weighted image information in response to the weight information, in response to the scale factor information, and in response to the data compressed image information;
- generating transformed image information in response to the scaled weighted image information;
- generating second spatially interpolated image information in response to the transformed image information;
- generating temporally interpolated image information in response to the second spatially interpolated image information; and
- generating the feedback information in response to the temporally interpolated image information.

.392. A process as set forth in claim 390, further comprising the act of making a building product in response to the process.

393. A process as set forth in claim 159, further comprising the acts of:
generating second camera image information; and
generating the artificial intelligence information in response to the second camera image information and in response to the computer instructions.

394. A process as set forth in claim 390, further comprising the acts of:
storing prior frame first field horizontal-axis motion vector information;
storing prior frame first field vertical-axis motion vector information;
storing prior frame second field horizontal-axis motion vector information;
storing prior frame second field vertical-axis motion vector information;
storing next frame first field horizontal-axis motion vector information;
storing next frame first field vertical-axis motion vector information;
storing next frame second field horizontal-axis motion vector information;
storing next frame second field vertical-axis motion vector information; and
generating the spatially interpolated image information in response to the frame of pixel image information, in response to the prior frame first field horizontal-axis motion vector information, in response to the prior frame first field vertical-axis motion vector information, in response to the prior frame second field horizontal-axis motion vector information, in response to the prior frame second field vertical-axis motion vector information, in response to the next frame first field horizontal-axis motion vector information, in response to the next frame first field vertical-axis motion vector information, in response to the next frame second field horizontal-axis motion vector information, and in response to the next frame second field vertical-axis motion vector information.

395. A process comprising the acts of:
storing a prior 64-pixel block of image information;
storing a next 64-pixel block of image information;

.generating a first temporally interpolated 64-pixel block of image information between the prior 64-pixel block of image information and the next 64-pixel block of image information;

generating a second temporally interpolated 64-pixel block of image information between the prior 64-pixel block of image information and the next 64-pixel block of image information;

generating a third temporally interpolated 64-pixel block of image information between the prior 64-pixel block of image information and the next 64-pixel block of image information;

generating first reduced resolution image information in response to the first temporally interpolated 64-pixel block of image information;

generating second reduced resolution image information in response to the second temporally interpolated 64-pixel block of image information; and

generating third reduced resolution image information in response to the third temporally interpolated 64-pixel block of image information.

396. A system as set forth in claim 121,

wherein the prior vector information includes prior frame first field horizontal-axis motion vector information, prior frame first field vertical-axis motion vector information, prior frame second field horizontal-axis motion vector information, and prior frame second field vertical-axis motion vector information; and

wherein the next vector information includes next frame first field horizontal-axis motion vector information, next frame first field vertical-axis motion vector information, next frame second field horizontal-axis motion vector information, and next frame second field vertical-axis motion vector information.

397. A process as set forth in claim 395, further comprising the act of making a vehicle product in response to the process.

.398. A process comprising the acts of:
storing computer instructions;
generating navigation information in response to the computer instructions;
generating infra-red information with an infra-red sensor;
generating feedback information in response to the computer instructions; and
controlling a robot in response to the computer instructions and in response to the
infra-red information.

399. A process as set forth in claim 159, further comprising the acts of:
generating infra-red image information; and
generating the artificial intelligence information in response to the infra-red
image information and in response to the computer instructions.

400. A process as set forth in claim 105, further comprising the act of making a product
in response to the process.

401. A process as set forth in claim 159, further comprising the acts of:
generating radar image information; and
generating the artificial intelligence information in response to the radar
image information and in response to the computer instructions.

402. A process as set forth in claim 197, further comprising the acts of:
generating second camera image information; and
generating the graphic overlaid image information in response to the second
camera image information and in response to the computer instructions.

403. A process as set forth in claim 113, further comprising the act of making a product
in response to the process.

.404. A process as set forth in claim 197, further comprising the acts of:
generating infra-red image information; and
generating the graphic overlaid image information in response to the infra-red image information and in response to the computer instructions.

405. A system as set forth in claim 141,
wherein the prior vector information includes prior frame first field horizontal-axis vector information, prior frame first field vertical-axis vector information, prior frame second field horizontal-axis vector information, and prior frame second field vertical-axis vector information; and

wherein the next vector information includes next frame first field horizontal-axis vector information, next frame first field vertical-axis vector information, next frame second field horizontal-axis vector information, and next frame second field vertical-axis vector information.

406. A process as set forth in claim 115, further comprising the act of making a machined product in response to the process.

407. A process as set forth in claim 115, further comprising the acts of:
storing prior frame first field horizontal-axis motion vector information;
storing prior frame first field vertical-axis motion vector information;
storing prior frame second field horizontal-axis motion vector information;
storing prior frame second field vertical-axis motion vector information;
storing next frame first field horizontal-axis motion vector information;
storing next frame first field vertical-axis motion vector information;
storing next frame second field horizontal-axis motion vector information;
storing next frame second field vertical-axis motion vector information; and

.generating the 64-pixel blocks of spatially interpolated image information in response to the prior pixel image information, in response to the next pixel image information, in response to the prior frame first field horizontal-axis motion vector information, in response to the prior frame first field vertical-axis motion vector information, in response to the prior frame second field horizontal-axis motion vector information, in response to the prior frame second field vertical-axis motion vector information, in response to the next frame first field horizontal-axis motion vector information, in response to the next frame first field vertical-axis motion vector information, in response to the next frame second field horizontal-axis motion vector information, and in response to the next frame second field vertical-axis motion vector information.

408. A process as set forth in claim 197, further comprising the acts of:
generating radar image information; and
generating the graphic overlaid image information in response to the radar image information and in response to the computer instructions.

409. A process as set forth in claim 106, further comprising the act of making a product in response to the process.

410. A process as set forth in claim 204, further comprising the acts of:
generating second camera image information; and
generating the warped image information in response to the second camera image information and in response to the computer instructions.

411. A process as set forth in claim 125, further comprising the acts of:
storing prior frame first field horizontal-axis motion vector information;
storing prior frame first field vertical-axis motion vector information;
storing prior frame second field horizontal-axis motion vector information;
storing prior frame second field vertical-axis motion vector information;
storing next frame first field horizontal-axis motion vector information;

.storing next frame first field vertical-axis motion vector information;
 storing next frame second field horizontal-axis motion vector information;
 storing next frame second field vertical-axis motion vector information;
 generating spatially interpolated image information in response to the prior pixel
 image information, in response to the next pixel image information, in response to the prior
 frame first field horizontal-axis motion vector information, in response to the prior frame first
 field vertical-axis motion vector information, in response to the prior frame second field
 horizontal-axis motion vector information, in response to the prior frame second field vertical-
 axis motion vector information, in response to the next frame first field horizontal-axis motion
 vector information, in response to the next frame first field vertical-axis motion vector
 information, in response to the next frame second field horizontal-axis motion vector
 information, and in response to the next frame second field vertical-axis motion vector
 information; and
 generating the temporally interpolated image information in response to the
 spatially interpolated image information.

412. A process as set forth in claim 127, further comprising the act of making a product in response to the process.

413. A process as set forth in claim 204, further comprising the acts of:
 generating infra-red image information; and
 generating the warped image information in response to the infra-red
 image information and in response to the computer instructions.

414. A process as set forth in claim 127, further comprising the acts of:
 storing prior frame first field horizontal-axis motion vector information;
 storing prior frame first field vertical-axis motion vector information;
 storing prior frame second field horizontal-axis motion vector information;
 storing prior frame second field vertical-axis motion vector information;
 storing next frame first field horizontal-axis motion vector information;

.storing next frame first field vertical-axis motion vector information;
 storing next frame second field horizontal-axis motion vector information;
 storing next frame second field vertical-axis motion vector information;
 generating spatially interpolated image information in response to the prior pixel
 image information, in response to the next pixel image information, in response to the prior
 frame first field horizontal-axis motion vector information, in response to the prior frame first
 field vertical-axis motion vector information, in response to the prior frame second field
 horizontal-axis motion vector information, in response to the prior frame second field vertical-
 axis motion vector information, in response to the next frame first field horizontal-axis motion
 vector information, in response to the next frame first field vertical-axis motion vector
 information, in response to the next frame second field horizontal-axis motion vector
 information, and in response to the next frame second field vertical-axis motion vector
 information; and
 generating the transformed image information in response to the spatially
 interpolated image information.

415. A process as set forth in claim 143, further comprising the act of making a product in response to the process.

416. A process as set forth in claim 204, further comprising the acts of:
 generating radar image information; and
 generating the warped image information in response to the radar
 image information and in response to the computer instructions.

418. A process as set forth in claim 533, further comprising the acts of:
 generating radar image information; and
 generating the zoomed image information in response to the radar
 image information and in response to the computer instructions.

.419. A process as set forth in claim 143, further comprising the acts of:
generating second infra-red image information; and
generating the pattern recognition information in response to the second infra-red image information and in response to the computer instructions.

420. A process as set forth in claim 143, further comprising the acts of:
generating radar image information; and
generating the pattern recognition information in response to the radar image information and in response to the computer instructions.

421. A process as set forth in claim 171, further comprising the act of operating a business in response to the process.

422. A system comprising:
a satellite navigator generating satellite navigation information;
a data link communicating data link information from a remote location;
a disk memory storing disk memory information; and
a display displaying an image in response to the satellite navigation information, in response to the data link information, and in response to the disk memory information.

423. A process as set forth in claim 161, further comprising the acts of:
generating second infra-red image information; and
generating the artificial intelligence information in response to the second infra-red image information and in response to the computer instructions.

424. A process as set forth in claim 161, further comprising the act of making a machined product in response to the process.

.425. A process as set forth in claim 161, further comprising the acts of:
generating camera image information; and
generating the artificial intelligence information in response to the camera image information and in response to the computer instructions.

426. A process as set forth in claim 195, further comprising the act of generating artificial intelligence information in response to the scaled weighted image information.

427. A process comprising the acts of:
generating GPS navigation information;
communicating data link information from a remote location with a data link;
storing disk memory information in a disk memory; and
displaying an image in response to the GPS navigation information, in response to the data link information, and in response to the disk memory information.

428. A process as set forth in claim 163, further comprising the acts of:
generating camera image information; and
generating the artificial intelligence information in response to the camera image information and in response to the computer instructions.

429. A process as set forth in claim 171, further comprising the act of making a product in response to the process.

430. A process as set forth in claim 163, further comprising the acts of:
generating infra-red image information; and
generating the artificial intelligence information in response to the infra-red image information and in response to the computer instructions.

.431. A process as set forth in claim 171,
wherein the prior motion vector information includes prior frame horizontal-axis motion vector information and prior frame vertical-axis motion vector information; and
wherein the next motion vector information includes next frame horizontal-axis motion vector information and next frame vertical-axis motion vector information.

432. A process as set forth in claim 187, further comprising the act of making a manufactured product in response to the process set forth in claim 187.

433. A process as set forth in claim 261, further comprising the acts of:
generating first data compressed image information by data compressing in response to the transformed image information;
generating communicated second data compressed image information with a data link in response to the first data compressed image information;
generating data decompressed image information by data decompressing in response to the communicated second data compressed image information; and
displaying an image in response to the data decompressed image information.

434. A process as set forth in claim 187,
wherein the prior vector information includes prior frame first field horizontal-axis motion vector information, prior frame first field vertical-axis motion vector information, prior frame second field horizontal-axis motion vector information, and prior frame second field vertical-axis motion vector information; and
wherein the next vector information includes next frame first field horizontal-axis motion vector information, next frame first field vertical-axis motion vector information, next frame second field horizontal-axis motion vector information, and next frame second field vertical-axis motion vector information.

.435. A process as set forth in claim 203, further comprising the acts of:
generating second infra-red image information; and
generating the graphic overlaid image information in response to the second infra-red image information and in response to the computer instructions.

436. A process as set forth in claim 203, further comprising the acts of:
generating radar image information; and
generating the graphic overlaid image information in response to the radar image information and in response to the computer instructions.

437. A process as set forth in claim 171, further comprising the acts of:
storing prior frame first field horizontal-axis motion vector information;
storing prior frame first field vertical-axis motion vector information;
storing prior frame second field horizontal-axis motion vector information;
storing prior frame second field vertical-axis motion vector information;
storing next frame first field horizontal-axis motion vector information;
storing next frame first field vertical-axis motion vector information;
storing next frame second field horizontal-axis motion vector information;
storing next frame second field vertical-axis motion vector information; and
generating the 64-pixel blocks of spatially interpolated image information in response to the prior pixel image information, in response to the next pixel image information, in response to the prior frame first field horizontal-axis motion vector information, in response to the prior frame first field vertical-axis motion vector information, in response to the prior frame second field horizontal-axis motion vector information, in response to the prior frame second field vertical-axis motion vector information, in response to the next frame first field horizontal-axis motion vector information, in response to the next frame first field vertical-axis motion vector information, in response to the next frame second field horizontal-axis motion vector information, and in response to the next frame second field vertical-axis motion vector information.

.438. A process as set forth in claim 203, further comprising the acts of:
generating camera image information; and
generating the graphic overlaid image information in response to the camera image information and in response to the computer instructions.

439. A process as set forth in claim 273, further comprising the acts of:
generating the scaled weighted image information as a first channel of scaled weighted image information representing a first perspective of an image in response to the transformed image information, in response to the scale factor information, and in response to the weight input information and as a second channel of scaled weighted image information representing a second perspective of the image in response to the transformed image information, in response to the scale factor information, and in response to the weight input information, wherein the second perspective of the image is horizontally offset from the first perspective of the image; and
generating multiplexed image information in response to the first channel of scaled weighted image information and in response to the second channel of scaled weighted image information.

440. A system as set forth in claim 212, further comprising the acts of:
generating second infra-red image information; and
generating the warped image information in response to the second infra-red image information and in response to the computer instructions.

441. A process as set forth in claim 212, further comprising the acts of:
generating radar image information; and
generating the warped image information in response to the radar image information and in response to the computer instructions.

.442. A process as set forth in claim 212, further comprising the acts of:
generating camera image information; and
generating the warped image information in response to the camera
image information and in response to the computer instructions.

443. A process as set forth in claim 190, further comprising the acts of:
storing prior frame horizontal-axis motion vector information;
storing prior frame vertical-axis motion vector information;
storing next frame horizontal-axis motion vector information;
storing next frame vertical-axis motion vector information;
generating spatially interpolated image information in response to the computer
instructions, in response to the radar information, in response to the prior frame horizontal-axis
motion vector information, in response to the prior frame vertical-axis motion vector
information, in response to the next frame horizontal-axis motion vector information, and in
response to the next frame vertical-axis motion vector information.

444. A process as set forth in claim 201, further comprising the act of making a product
in response to the process.

445. A process as set forth in claim 187, further comprising the acts of:
storing prior frame horizontal-axis motion vector information;
storing prior frame vertical-axis motion vector information;
storing next frame horizontal-axis motion vector information;
storing next frame vertical-axis motion vector information; and
generating the 64-pixel blocks of temporally interpolated image information in
response to the prior pixel image information, in response to the next pixel image information, in
response to the prior frame horizontal-axis motion vector information, in response to the prior
frame vertical-axis motion vector information, in response to the next frame horizontal-axis
motion vector information, and in response to the next frame vertical-axis motion vector
information.

.446. A process as set forth in claim 201, further comprising the acts of:

- storing prior frame first field horizontal-axis motion vector information;
- storing prior frame first field vertical-axis motion vector information;
- storing prior frame second field horizontal-axis motion vector information;
- storing prior frame second field vertical-axis motion vector information;
- storing next frame first field horizontal-axis motion vector information;
- storing next frame first field vertical-axis motion vector information;
- storing next frame second field horizontal-axis motion vector information;
- storing next frame second field vertical-axis motion vector information; and
- generating 64-pixel blocks of spatially interpolated image information in response

to the computer instructions, in response to the translated image information, in response to the prior frame first field horizontal-axis motion vector information, in response to the prior frame first field vertical-axis motion vector information, in response to the prior frame second field horizontal-axis motion vector information, in response to the prior frame second field vertical-axis motion vector information, in response to the next frame first field horizontal-axis motion vector information, in response to the next frame first field vertical-axis motion vector information, in response to the next frame second field horizontal-axis motion vector information, and in response to the next frame second field vertical-axis motion vector information.

447. A process as set forth in claim 204, further comprising the act of making a product in response to the process.

448. A process comprising the acts of:

- storing prior frame first field horizontal-axis motion vector information;
- storing prior frame first field vertical-axis motion vector information;
- storing prior frame second field horizontal-axis motion vector information;
- storing prior frame second field vertical-axis motion vector information;
- storing next frame first field horizontal-axis motion vector information;
- storing next frame first field vertical-axis motion vector information;

.storing next frame second field horizontal-axis motion vector information;
storing next frame second field vertical-axis motion vector information; and
generating 64-pixel blocks of spatially interpolated image information in response to the prior frame first field horizontal-axis motion vector information, in response to the prior frame first field vertical-axis motion vector information, in response to the prior frame second field horizontal-axis motion vector information, in response to the prior frame second field vertical-axis motion vector information, in response to the next frame first field horizontal-axis motion vector information, in response to the next frame first field vertical-axis motion vector information, in response to the next frame second field horizontal-axis motion vector information, and in response to the next frame second field vertical-axis motion vector information.

449. A process as set forth in claim 209, further comprising the act of making a product in response to the process.

450. A process as set forth in claim 209,
wherein the prior motion vector information includes prior frame first field horizontal-axis motion vector information, prior frame first field vertical-axis motion vector information, prior frame second field horizontal-axis motion vector information, and prior frame second field vertical-axis motion vector information; and

wherein the next motion vector information includes next frame first field horizontal-axis motion vector information, next frame first field vertical-axis motion vector information, next frame second field horizontal-axis motion vector information, and next frame second field vertical-axis motion vector information.

451. A process as set forth in claim 107, further comprising the act of making a product in response to the process.

.452. A process as set forth in claim 279, further comprising the acts of:
generating a first channel of output image information representing a first perspective of an image in response to the transformed image information; and
generating a second channel of output image information representing a second perspective of the image in response to the first channel of output image information, wherein the second perspective of the image is from a different horizontal displacement than the horizontal displacement of the first perspective of the image; and
generating multiplexed image information in response to the first channel of output image information and in response to the second channel of output image information.

453. A process as set forth in claim 535, further comprising the acts of:
generating second infra-red image information; and
generating the zoomed image information in response to the second infra-red image information and in response to the computer instructions.

454. A process as set forth in claim 108, further comprising the act of making a product in response to the process.

455. A process comprising the acts of:
storing prior frame horizontal-axis motion vector information;
storing prior frame vertical-axis motion vector information;
storing next frame horizontal-axis motion vector information;
storing next frame vertical-axis motion vector information;
generating spatially interpolated image information in response to the prior frame horizontal-axis motion vector information, in response to the prior frame vertical-axis motion vector information, in response to the next frame horizontal-axis motion vector information, and in response to the next frame vertical-axis motion vector information; and
generating transformed image information in response to the spatially interpolated image information.

.456. A process as set forth in claim 535, further comprising the acts of:
generating radar image information; and
generating the zoomed image information in response to the radar
image information and in response to the computer instructions.

457. A process as set forth in claim 120, further comprising the act of making a product
in response to the process.

458. A process as set forth in claim 535, further comprising the acts of:
generating camera image information; and
generating the zoomed image information in response to the camera
image information and in response to the computer instructions.

459. A process as set forth in claim 223, further comprising the act of operating a
business in response to the process.

460. A process as set forth in claim 223, further comprising the acts of:
storing prior frame horizontal-axis motion vector information;
storing prior frame vertical-axis motion vector information;
storing next frame horizontal-axis motion vector information;
storing next frame vertical-axis motion vector information;
generating spatially interpolated image information in response to the prior pixel
image information, in response to the next pixel image information, in response to the prior
frame horizontal-axis motion vector information, in response to the prior frame vertical-axis
motion vector information, in response to the next frame horizontal-axis motion vector
information, and in response to the next frame vertical-axis motion vector information; and
generating the transformed image information in response to the spatially
interpolated image information.

.461. A process as set forth in claim 223, further comprising the acts of:

- storing prior frame first field horizontal-axis motion vector information;
- storing prior frame first field vertical-axis motion vector information;
- storing prior frame second field horizontal-axis motion vector information;
- storing prior frame second field vertical-axis motion vector information;
- storing next frame first field horizontal-axis motion vector information;
- storing next frame first field vertical-axis motion vector information;
- storing next frame second field horizontal-axis motion vector information;
- storing next frame second field vertical-axis motion vector information;
- generating spatially interpolated image information in response to the prior pixel image information, in response to the next pixel image information, in response to the prior frame first field horizontal-axis motion vector information, in response to the prior frame first field vertical-axis motion vector information, in response to the prior frame second field horizontal-axis motion vector information, in response to the prior frame second field vertical-axis motion vector information, in response to the next frame first field horizontal-axis motion vector information, in response to the next frame first field vertical-axis motion vector information, in response to the next frame second field horizontal-axis motion vector information, and in response to the next frame second field vertical-axis motion vector information; and
- generating the transformed image information in response to the spatially interpolated image information.

462. A process as set forth in claim 226, further comprising the act of making a product in response to the process.

463. A process as set forth in claim 107, further comprising the acts of:

- generating second radar image information; and
- generating the temporally interpolated information in response to the second radar image information and in response to the computer instructions.

- .464. A process as set forth in claim 107, further comprising the acts of:
generating camera image information; and
generating the temporally interpolated information in response to the camera image information and in response to the computer instructions.
465. A process as set forth in claim 229, further comprising the act of making a product in response to the process.
466. A process as set forth in claim 107, further comprising the acts of:
generating infra-red image information; and
generating the temporally interpolated information in response to the infra-red image information and in response to the computer instructions.
467. A process as set forth in claim 124, further comprising the acts of:
generating second radar image information; and
generating the kernel filtered image information in response to the second radar image information and in response to the computer instructions.
468. A process as set forth in claim 124, further comprising the acts of:
generating camera image information; and
generating the kernel filtered image information in response to the camera image information and in response to the computer instructions.
469. A process as set forth in claim 232, further comprising the acts of:
storing prior frame horizontal-axis motion vector information;
storing prior frame vertical-axis motion vector information;
storing next frame horizontal-axis motion vector information;
storing next frame vertical-axis motion vector information; and

.generating the 64-pixel blocks of image information in response to the pixel image information, in response to the prior frame horizontal-axis motion vector information, in response to the prior frame vertical-axis motion vector information, in response to the next frame horizontal-axis motion vector information, and in response to the next frame vertical-axis motion vector information.

470. A process as set forth in claim 232, further comprising the acts of:

- storing prior frame first field horizontal-axis motion vector information;
- storing prior frame first field vertical-axis motion vector information;
- storing prior frame second field horizontal-axis motion vector information;
- storing prior frame second field vertical-axis motion vector information;
- storing next frame first field horizontal-axis motion vector information;
- storing next frame first field vertical-axis motion vector information;
- storing next frame second field horizontal-axis motion vector information;
- storing next frame second field vertical-axis motion vector information; and
- generating the 64-pixel blocks of image information in response to the pixel image information, in response to the prior frame first field horizontal-axis motion vector information, in response to the prior frame first field vertical-axis motion vector information, in response to the prior frame second field horizontal-axis motion vector information, in response to the prior frame second field vertical-axis motion vector information, in response to the next frame first field horizontal-axis motion vector information, in response to the next frame first field vertical-axis motion vector information, in response to the next frame second field horizontal-axis motion vector information, and in response to the next frame second field vertical-axis motion vector information.

471. A process as set forth in claim 235, further comprising the act of making a product in response to the process.

.472. A process comprising the acts of:

- generating a first channel of output image information representing a first perspective of an image;
- generating a second channel of output image information representing a second perspective of the image, wherein the second perspective of the image is from a different X-axis position than the X-axis position of the first perspective of the image; and
- generating multiplexed image information in response to the first channel of output image information and in response to the second channel of output image information.

473. A process as set forth in claim 235,

- wherein the prior motion vector information includes prior frame first field horizontal-axis motion vector information, prior frame first field vertical-axis motion vector information, prior frame second field horizontal-axis motion vector information, and prior frame second field vertical-axis motion vector information; and
- wherein the next motion vector information includes next frame first field horizontal-axis motion vector information, next frame first field vertical-axis motion vector information, next frame second field horizontal-axis motion vector information, and next frame second field vertical-axis motion vector information.

474. A process as set forth in claim 455, further comprising the act of making a product in response to the process.

475. A process as set forth in claim 238, further comprising the acts of:

- storing prior frame first field horizontal-axis motion vector information;
- storing prior frame first field vertical-axis motion vector information;
- storing prior frame second field horizontal-axis motion vector information;
- storing prior frame second field vertical-axis motion vector information;
- storing next frame first field horizontal-axis motion vector information;
- storing next frame first field vertical-axis motion vector information;
- storing next frame second field horizontal-axis motion vector information;

.storing next frame second field vertical-axis motion vector information;
generating spatially interpolated image information in response to the frame of prior pixel image information, in response to the frame of next pixel image information, in response to the prior frame first field horizontal-axis motion vector information, in response to the prior frame first field vertical-axis motion vector information, in response to the prior frame second field horizontal-axis motion vector information, in response to the prior frame second field vertical-axis motion vector information, in response to the next frame first field horizontal-axis motion vector information, in response to the next frame first field vertical-axis motion vector information, in response to the next frame second field horizontal-axis motion vector information, and in response to the next frame second field vertical-axis motion vector information; and
generating the weighted image information in response to the spatially interpolated image information.

476. A process as set forth in claim 388, further comprising the act of making a product in response to the process.

477. A process as set forth in claim 241, further comprising the acts of:
storing prior frame horizontal-axis motion vector information;
storing prior frame vertical-axis motion vector information;
storing next frame horizontal-axis motion vector information;
storing next frame vertical-axis motion vector information;
generating spatially interpolated image information in response to the prior pixel image information, in response to the next pixel image information, in response to the prior frame horizontal-axis motion vector information, in response to the prior frame vertical-axis motion vector information, in response to the next frame horizontal-axis motion vector information, and in response to the next frame vertical-axis motion vector information; and
generating the scaled weighted image information in response to the spatially interpolated image information.

.478. A process as set forth in claim 241, further comprising the acts of:

- storing prior frame first field horizontal-axis motion vector information;
- storing prior frame first field vertical-axis motion vector information;
- storing prior frame second field horizontal-axis motion vector information;
- storing prior frame second field vertical-axis motion vector information;
- storing next frame first field horizontal-axis motion vector information;
- storing next frame first field vertical-axis motion vector information;
- storing next frame second field horizontal-axis motion vector information;
- storing next frame second field vertical-axis motion vector information;
- generating spatially interpolated image information in response to the prior pixel image information, in response to the next pixel image information, in response to the prior frame first field horizontal-axis motion vector information, in response to the prior frame first field vertical-axis motion vector information, in response to the prior frame second field horizontal-axis motion vector information, in response to the prior frame second field vertical-axis motion vector information, in response to the next frame first field horizontal-axis motion vector information, in response to the next frame first field vertical-axis motion vector information, in response to the next frame second field horizontal-axis motion vector information, and in response to the next frame second field vertical-axis motion vector information; and
- generating the scaled weighted image information in response to the spatially interpolated image information.

479. A process as set forth in claim 232, wherein at least one of the 64-pixel blocks of image information comprises 64-pixels of eight bits per pixel.

480. A process as set forth in claim 244, further comprising the acts of:

- storing prior frame first field horizontal-axis motion vector information;
- storing prior frame first field vertical-axis motion vector information;
- storing prior frame second field horizontal-axis motion vector information;
- storing prior frame second field vertical-axis motion vector information;

.storing next frame first field horizontal-axis motion vector information;
 storing next frame first field vertical-axis motion vector information;
 storing next frame second field horizontal-axis motion vector information;
 storing next frame second field vertical-axis motion vector information;
 generating a spatially interpolated 64-pixel block of image information in
 response to the prior 64-pixel block of pixel image information, in response to the next 64-pixel
 block of pixel image information, in response to the prior frame first field horizontal-axis motion
 vector information, in response to the prior frame first field vertical-axis motion vector
 information, in response to the prior frame second field horizontal-axis motion vector
 information, in response to the prior frame second field vertical-axis motion vector information,
 in response to the next frame first field horizontal-axis motion vector information, in response to
 the next frame first field vertical-axis motion vector information, in response to the next frame
 second field horizontal-axis motion vector information, and in response to the next frame second
 field vertical-axis motion vector information; and
 generating the temporally interpolated 64-pixel block of image information in
 response to the spatially interpolated 64-pixel block of image information.

481. A process as set forth in claim 539, further comprising the acts of:
 generating second radar image information; and
 generating the zoomed image information in response to the second radar
 image information and in response to the computer instructions.

482. A process as set forth in claim 539, further comprising the acts of:
 generating camera image information; and
 generating the zoomed image information in response to the camera
 image information and in response to the computer instructions.

.483. A process as set forth in claim 539, further comprising the acts of:
generating infra-red image information; and
generating the zoomed image information in response to the infra-red
image information and in response to the computer instructions.

484. A process as set forth in claim 485, further comprising the act of making a product
in response to the process.

485. A process comprising the acts of:
storing prior frame first field horizontal-axis motion vector information;
storing prior frame first field vertical-axis motion vector information;
storing prior frame second field horizontal-axis motion vector information;
storing prior frame second field vertical-axis motion vector information;
storing next frame first field horizontal-axis motion vector information;
storing next frame first field vertical-axis motion vector information;
storing next frame second field horizontal-axis motion vector information;
storing next frame second field vertical-axis motion vector information; and
displaying an image in response to the prior frame first field horizontal-axis
motion vector information, in response to the prior frame first field vertical-axis motion vector
information, in response to the prior frame second field horizontal-axis motion vector
information, in response to the prior frame second field vertical-axis motion vector information,
in response to the next frame first field horizontal-axis motion vector information, in response to
the next frame first field vertical-axis motion vector information, in response to the next frame
second field horizontal-axis motion vector information, and in response to the next frame second
field vertical-axis motion vector information.

486. A process as set forth in claim 255, further comprising the act of making a disk
product in response to the process.

.487. A process as set forth in claim 206, further comprising the acts of:
generating second radar image information; and
generating the graphic overlaid image information in response to the second radar image information and in response to the computer instructions.

488. A process as set forth in claim 206, further comprising the acts of:
generating camera image information; and
generating the graphic overlaid image information in response to the camera image information and in response to the computer instructions.

489. A process as set forth in claim 398, further comprising the act of making a product in response to the process.

490. A process as set forth in claim 206, further comprising the acts of:
generating infra-red image information; and
generating the graphic overlaid image information in response to the infra-red image information and in response to the computer instructions..

491. A process as set forth in claim 533, further comprising the acts of:
generating second camera image information; and
generating the zoomed image information in response to the second camera image information and in response to the computer instructions.

492. A process as set forth in claim 261, further comprising the act of operating a business in response to the process.

493. A process as set forth in claim 232, further comprising the acts of:
generating data compressed image information in response to the 64-pixel blocks of image information;
storing weight information;

.storing scale factor information;
 generating scaled weighted image information in response to the weight information, in response to the scale factor information, and in response to the data compressed image information;
 generating transformed image information in response to the scaled weighted image information;
 generating spatially interpolated image information in response to the transformed image information;
 generating temporally interpolated image information in response to the spatially interpolated image information; and
 generating the pixel image information in response to the temporally interpolated image information.

494. A process as set forth in claim 261, further comprising the acts of:
 storing prior frame first field horizontal-axis motion vector information;
 storing prior frame first field vertical-axis motion vector information;
 storing prior frame second field horizontal-axis motion vector information;
 storing prior frame second field vertical-axis motion vector information;
 storing next frame first field horizontal-axis motion vector information;
 storing next frame first field vertical-axis motion vector information;
 storing next frame second field horizontal-axis motion vector information;
 storing next frame second field vertical-axis motion vector information;
 generating spatially interpolated image information in response to the prior pixel image information, in response to the next pixel image information, in response to the prior frame first field horizontal-axis motion vector information, in response to the prior frame first field vertical-axis motion vector information, in response to the prior frame second field horizontal-axis motion vector information, in response to the prior frame second field vertical-axis motion vector information, in response to the next frame first field horizontal-axis motion vector information, in response to the next frame first field vertical-axis motion vector information, in response to the next

.frame second field horizontal-axis motion vector information, and in response to the next frame second field vertical-axis motion vector information; and

generating the transformed image information in response to the spatially interpolated image information.

495. A process as set forth in claim 264, further comprising the act of making a building product in response to the process.

496. A process as set forth in claim 270, further comprising the acts of:

generating data compressed image information in response to the scaled weighted image information;

generating second scaled weighted image information in response to the weight information, in response to the scale factor information, and in response to the data compressed image information;

generating second transformed image information in response to the scaled weighted image information;

generating spatially interpolated image information in response to the second transformed image information;

generating temporally interpolated image information in response to the spatially interpolated image information; and

generating the feedback information in response to the temporally interpolated image information.

497. A process as set forth in claim 109, further comprising the acts of:

generating data compressed image information in response to the temporally interpolated image information;

generating spatially interpolated image information in response to the data compressed image information;

generating second temporally interpolated image information in response to the spatially interpolated image information; and

.generating the prior 64-pixel block of image information in response to the second temporally interpolated image information.

498. A process as set forth in claim 267, further comprising the act of making a vehicle product in response to the process.

499. A process as set forth in claim 115, further comprising the acts of:

generating data compressed 64-pixel blocks of image information in response to the 64-pixel blocks of spatially interpolated image information;

generating 64-pixel blocks of second spatially interpolated image information in response to the data compressed 64-pixel blocks of image information;

generating 64-pixel blocks of temporally interpolated image information in response to the 64-pixel blocks of second spatially interpolated image information; and

generating the prior pixel image information in response to the 64-pixel blocks of temporally interpolated image information.

500. A process as set forth in claim 270, further comprising the act of making a manufactured product in response to the process.

501. A process as set forth in claim 125, further comprising the acts of:

generating spatially interpolated image information in response to the temporally interpolated image information;

generating second temporally interpolated image information in response to the spatially interpolated image information; and

generating the prior pixel image information in response to the second temporally interpolated image information.

.502. A process as set forth in claim 127, further comprising the acts of:
generating data compressed image information in response to the transformed image information;
generating spatially interpolated image information in response to the data compressed image information;
generating temporally interpolated image information in response to the spatially interpolated image information; and
generating the prior pixel image information in response to the temporally interpolated image information.

503. A process as set forth in claim 273, wherein at least one of the 64-pixel blocks of spatially interpolated image information comprises 64-pixels of eight bits per pixel.

504. A process as set forth in claim 533, further comprising the acts of:
generating infra-red image information; and
generating the zoomed image information in response to the infra-red image information and in response to the computer instructions.

505. A process as set forth in claim 143, further comprising the acts of:
generating camera image information; and
generating the pattern recognition information in response to the camera image information and in response to the computer instructions.

506. A process as set forth in claim 276, further comprising the act of making a manufactured product in response to the process.

507. A process as set forth in claim 163, further comprising the acts of:
generating second radar image information; and
generating the artificial intelligence information in response to the second radar image information and in response to the computer instructions.

.508. A process as set forth in claim 279, further comprising the act of making a machined product in response to the process.

509. A process as set forth in claim 161, further comprising the acts of:
generating radar image information; and
generating the artificial intelligence information in response to the radar image information and in response to the computer instructions.

510. A process as set forth in claim 195, further comprising the acts of:
generating second transformed image information in response to the scaled weighted image information; and
generating the temporally interpolated image information in response to the second transformed image information.

511. A process comprising the acts of:
storing a first field of image information;
storing a second field of image information;
generating first field vector information in response to the first field of image information;
generating second field vector information in response to the second field of image information;
generating a first field of temporally interpolated image information by temporally interpolating in response to the first field of image information, in response to the second field of image information, in response to the first field vector information, and in response to the second field vector information; and
generating a second field of temporally interpolated image information by temporally interpolating in response to the first field of image information, in response to the second field of image information, in response to the first field vector information, and in response to the second field vector information.

.512. A process as set forth in claim 511, comprising the act of:

generating multiplexed information by multiplexing in response to the first field of image information, in response to the second field of image information, in response to the first field of temporally interpolated image information, in response to the second field of temporally interpolated image information, in response to the first field vector information, and in response to the second field vector information.

513. A process comprising the acts of:

storing a first field of image information;
storing a second field of image information;
storing first field subpixel vector information;
storing second field subpixel vector information;

generating a first field of spatially interpolated image information by spatially interpolating in response to the first field of image information and in response to the first field subpixel vector information; and

generating a second field of spatially interpolated image information by spatially interpolating in response to the second field of image information and in response to the second field subpixel vector information.

514. A process as set forth in claim 513, comprising the act of:

displaying an image in response to the first field of spatially interpolated image information and in response to the second field of spatially interpolated image information.

515. A process comprising the acts of:

storing computer instructions;
generating inertial navigation information in response to the computer instructions;
generating video camera information with a video camera; and
generating zoomed image information in response to the computer instructions and in response to the video camera information.

.516. A process as set forth in claim 515, further comprising the act of:
generating artificial intelligence information in response to the inertial navigation information, in response to the zoomed image information, and in response to the computer instructions.

517. A process comprising the acts of:
storing a first field of image information;
storing a second field of image information;
storing first field vector information;
storing second field vector information;
generating a first field of scaled image information by scaling in response to the first field of image information, in response to the second field of image information, in response to the first field vector information, and in response to the second field vector information; and
generating a second field of scaled image information by scaling in response to the first field of image information, in response to the second field of image information, in response to the first field vector information, and in response to the second field vector information.

518. A process as set forth in claim 517, comprising the act of:
displaying an image in response to the first field of scaled image information and in response to the second field of scaled image information.

519. A process comprising the acts of:
storing a first field of image information;
storing a second field of image information;
generating first field subpixel vector information in response to the first field of image information;
generating second field subpixel vector information in response to the second field of image information;

.generating a first field of weighted image information by weighting in response to the first field of image information, in response to the second field of image information, in response to the first field subpixel vector information, and in response to the second field subpixel vector information; and

generating a second field of weighted image information by weighting in response to the first field of image information, in response to the second field of image information, in response to the first field subpixel vector information, and in response to the second field subpixel vector information.

520. A process as set forth in claim 519, comprising the act of:

generating multiplexed information by multiplexing in response to the first field of image information, in response to the second field of image information, in response to the first field of weighted image information, in response to the second field of weighted image information, in response to the first field subpixel vector information, and in response to the second field subpixel vector information.

521. A process comprising the acts of:

storing a first field of image information;
storing a second field of image information;
storing first field vector information;
storing second field vector information;
generating a first field of weighted image information by weighting in response to the first field of image information and in response to the first field vector information; and
generating a second field of weighted image information by weighting in response to the second field of image information and in response to the second field vector information.

522. A process as set forth in claim 521, comprising the act of:

displaying an image in response to the first field of weighted image information and in response to the second field of weighted image information.

.523. A process comprising the acts of:

- storing a first field of image information;
- storing a second field of image information;
- generating first field subpixel vector information in response to the first field of image information;
- generating second field subpixel vector information in response to the second field of image information;
- generating a first field of transformed image information by transforming in response to the first field of image information, in response to the second field of image information, in response to the first field subpixel vector information, and in response to the second field subpixel vector information; and
- generating a second field of transformed image information by transforming in response to the first field of image information, in response to the second field of image information, in response to the first field subpixel vector information, and in response to the second field subpixel vector information.

524. A process as set forth in claim 523, comprising the act of:

- generating multiplexed information by multiplexing in response to the first field of image information, in response to the second field of image information, in response to the first field of transformed image information, in response to the second field of transformed image information, in response to the first field subpixel vector information, and in response to the second field subpixel vector information.

525. A process comprising the acts of:

- storing computer instructions;
- generating television image information; and
- generating translated rotated image information in response to the television image information and in response to the computer instructions.

526. A process as set forth in claim 525, comprising the act of:
displaying an image in response to the computer instructions and in response to the translated rotated image information.

527. A process comprising the acts of:
storing computer instructions;
generating navigation information; and
generating translated rotated image information in response to the navigation information and in response to the computer instructions.

528. A process as set forth in claim 527, comprising the act of:
making a vehicle product in response to the process.

529. A process comprising the acts of:
storing a first field of image information;
storing a second field of image information;
storing first field motion vector information;
storing second field motion vector information;
generating a first field of interpolated image information by interpolating in response to the first field of image information, in response to the second field of image information, in response to the first field motion vector information, and in response to the second field motion vector information; and
generating a second field of interpolated image information by interpolating in response to the first field of image information, in response to the second field of image information, in response to the first field motion vector information, and in response to the second field motion vector information.

530. A process as set forth in claim 529, comprising the act of:
displaying an image in response to the first field of interpolated image information and in response to the second field of interpolated image information.

.531. A process comprising the acts of:

- storing a first field of image information;
- storing a second field of image information;
- generating first field subpixel motion vector information in response to the first field of image information;
- generating second field subpixel motion vector information in response to the second field of image information;
- generating a first field of scaled image information by scaling in response to the first field of image information and in response to the first field subpixel motion vector information; and
- generating a second field of scaled image information by scaling in response to the second field of image information and in response to the second field subpixel motion vector information.

532. A process as set forth in claim 531, comprising the act of:

- generating multiplexed information by multiplexing in response to the first field of image information, in response to the second field of image information, in response to the first field of scaled image information, in response to the second field of scaled image information, in response to the first field subpixel motion vector information, and in response to the second field subpixel motion vector information.

533. A process comprising the acts of:

- storing computer instructions;
- generating camera image information; and
- generating zoomed image information in response to the camera image information and in response to the computer instructions.

534. A process as set forth in claim 533, comprising the act of:

- displaying an image in response to the zoomed image information.

- .535. A process comprising the acts of:
storing computer instructions;
generating infra-red image information; and
generating zoomed image information in response to the infra-red image information and in response to the computer instructions.
536. A process comprising the acts of:
storing computer instructions;
generating GPS navigation information in response to the computer instructions;
generating camera information with a camera; and
generating data compressed image information in response to the computer instructions and in response to the camera information.
537. A process comprising the acts of:
storing a first field of image information;
storing a second field of image information;
storing first field subpixel motion vector information;
storing second field subpixel motion vector information;
generating a first field of weighted image information by weighting in response to the first field of image information and in response to the first field subpixel motion vector information; and
generating a second field of weighted image information by weighting in response to the second field of image information and in response to the second field subpixel motion vector information.
538. A process as set forth in claim 537, comprising the act of:
displaying an image in response to the first field of weighted image information and in response to the second field of weighted image information.

.539. A process comprising the acts of:
storing computer instructions;
generating radar image information; and
generating zoomed image information in response to the radar image information
and in response to the computer instructions.

540. A process as set forth in claim 539, comprising the act of:
generating artificial intelligence information by multiplexing in response to the
zoomed image information and in response to the computer instructions.

541. A process comprising the acts of:
storing a first field of image information;
storing a second field of image information;
storing first field subpixel motion vector information;
storing second field subpixel motion vector information;
generating a first field of transformed image information by transforming in
response to the first field of image information, in response to the second field of image
information, in response to the first field subpixel motion vector information, and in response to
the second field subpixel motion vector information; and
generating a second field of transformed image information by transforming in
response to the first field of image information, in response to the second field of image
information, in response to the first field subpixel motion vector information, and in response to
the second field subpixel motion vector information.

542. A process as set forth in claim 541, comprising the act of:
displaying an image in response to the first field of transformed image
information and in response to the second field of transformed image information.

.543. A process as set forth in claim 109, 115, 125, 127, 143, 153, 157, 161, 165, 171, 187, 533, 535, 537, 539, or 541, further comprising the acts of:

- making a first product in response to the process; and
- making a second product in response to the first product.

544. A process as set forth in claim 190, 198, 201, 204, 209, 215, 218, 523, 525, 527, or 529, further comprising the acts of:

- making a first product in response to the process; and
- making a second product in response to the first product.

545. A process as set forth in claim 223, 226, 232, 235, 238, 244, 249, 252, 255, 513, 515, 517, 519, or 521, further comprising the acts of:

- making a first product in response to the process;
- making a second product in response to the first product; and
- making a third product in response to the second product.

546. A process as set forth in claim 258, 261, 267, 270, 273, 276, 385, 390, or 395, further comprising the acts of:

- making a first product in response to the process;
- making a second product in response to the first product; and
- making a third product in response to the second product.

547. A process as set forth in claim 109, 113, 115, 126, 133, 145, 153, 157, 161, 190, 193, 198, 212, 215, 218, 525, 527, 529, 537, 539, or 541, further comprising the act of making a product in response to the process.

548. A process as set forth in claim 159, 167, 188, 195, 207, 211, 231, 238, 241, 244, 258, 261, 264, 276, 279, 385, 513, 515, 517, 519, or 521, further comprising the act of making a product in response to the process.

.549. A process comprising the acts of:
storing computer instructions;
generating inertial navigation information in response to the computer instructions;
generating video camera information with a video camera; and
inputting database information into a database memory in response to the computer instructions and in response to the video camera information.

550. A process comprising the acts of:
storing computer instructions;
generating inertial navigation information in response to the computer instructions;
generating video camera information with a video camera; and
generating rotated image information in response to the computer instructions and in response to the video camera information.

551. A process comprising the acts of:
storing computer instructions;
generating inertial navigation information in response to the computer instructions;
generating video camera information with a video camera; and
controlling a robot in response to the computer instructions and in response to the video camera information.

552. A process comprising the acts of:
storing computer instructions;
generating GPS navigation information in response to the computer instructions;
generating video camera information with a video camera;
generating artificial intelligence information in response to the computer instructions and in response to the video camera information; and

.loading database information into a database memory in response to the computer instructions and in response to the video camera information.

553. A process comprising the acts of:
storing computer instructions;
generating navigation information in response to the computer instructions;
generating radar information;
generating pattern recognition information in response to the computer instructions and in response to the radar information; and
inputting database information into a database memory in response to the computer instructions and in response to the radar information.

554. A process comprising the acts of:
storing computer instructions;
generating GPS navigation information in response to the computer instructions;
generating radar information;
generating data compressed image information in response to the computer instructions and in response to the radar information; and
loading database information into a database memory in response to the computer instructions and in response to the radar information.

555. A process comprising the acts of:
storing computer instructions;
generating navigation information in response to the computer instructions;
generating radar information;
generating spatially interpolated image information in response to the computer instructions and in response to the radar information; and
inputting database information into a database memory in response to the computer instructions and in response to the radar information.

- .556. A process comprising the acts of:
storing computer instructions;
generating GPS navigation information in response to the computer instructions;
generating radar information; and
generating 64-pixel blocks of image information in response to the computer instructions and in response to the radar information.
557. A process comprising the acts of:
storing computer instructions;
generating navigation information in response to the computer instructions;
generating radar information; and
generating zoomed image information in response to the computer instructions and in response to the radar information.
558. A process comprising the acts of:
storing computer instructions;
generating GPS navigation information in response to the computer instructions;
generating radar information;
generating translated image information in response to the computer instructions and in response to the radar information; and
generating overlaid graphics information in response to the computer instructions and in response to the radar information.
559. A process comprising the acts of:
storing computer instructions;
generating navigation information in response to the computer instructions;
generating radar information; and
generating warped image information in response to the computer instructions and in response to the radar information.

.560. A process comprising the acts of:
storing computer instructions;
generating inertial navigation information in response to the computer instructions;
generating radar information; and
controlling a robot in response to the computer instructions and in response to the radar information.

561. A process comprising the acts of:
storing computer instructions;
generating navigation information in response to the computer instructions;
generating video camera information with a video camera; and
generating pattern recognition information in response to the computer instructions and in response to the video camera information.

562. A process comprising the acts of:
storing computer instructions;
generating inertial navigation information in response to the computer instructions;
generating video camera information with a video camera; and
generating feedback information in response to the computer instructions and in response to the video camera information.

563. A process comprising the acts of:
storing computer instructions;
generating GPS navigation information in response to the computer instructions;
generating infra-red information with an infra-red sensor; and
generating data compressed image information in response to the computer instructions and in response to the infra-red information.

.564. A process comprising the acts of:
storing computer instructions;
generating navigation information in response to the computer instructions;
generating infra-red information with an infra-red sensor; and
generating overlaid graphics information in response to the computer instructions
and in response to the infra-red information.

565. A process comprising the acts of:
storing computer instructions;
generating inertial navigation information in response to the computer
instructions;
generating infra-red information with an infra-red sensor; and
generating temporally interpolated image information in response to the computer
instructions and in response to the infra-red information.

566. A process comprising the acts of:
storing computer instructions;
generating GPS navigation information in response to the computer instructions;
generating infra-red information with an infra-red sensor; and
generating 64-pixel blocks of image information in response to the computer
instructions and in response to the infra-red information.

567. A process comprising the acts of:
storing computer instructions;
generating inertial navigation information in response to the computer
instructions;
generating infra-red information with an infra-red sensor; and
generating 64-pixel blocks of image information in response to the computer
instructions and in response to the infra-red information.

.568. A process comprising the acts of:
storing computer instructions;
generating GPS navigation information in response to the computer instructions;
generating infra-red information with an infra-red sensor; and
generating warped image information in response to the computer instructions and
in response to the infra-red information.

569. A process comprising the acts of:
storing computer instructions;
generating inertial navigation information in response to the computer
instructions;
generating infra-red information with an infra-red sensor; and
generating artificial intelligence information in response to the computer
instructions and in response to the infra-red information.

570. A process comprising the acts of:
storing computer instructions;
generating GPS navigation information in response to the computer instructions;
generating infra-red information with an infra-red sensor; and
generating pattern recognition information in response to the computer
instructions and in response to the infra-red information.

571. A process comprising the acts of:
storing computer instructions;
generating navigation information in response to the computer instructions;
generating video camera information with a video camera; and
generating 64-pixel blocks of image information in response to the computer
instructions and in response to the video camera information.

- .572. A process comprising the acts of:
- storing computer instructions;
 - generating GPS navigation information in response to the computer instructions;
 - generating video camera information with a video camera; and
 - generating 64-pixel blocks of image information in response to the computer instructions and in response to the video camera information.
573. A process comprising the acts of:
- storing computer instructions;
 - generating navigation information in response to the computer instructions;
 - generating video camera information with a video camera; and
 - generating temporally interpolated image information in response to the computer instructions and in response to the video camera information.
574. A process comprising the acts of:
- storing computer instructions;
 - generating GPS navigation information in response to the computer instructions;
 - generating camera information with a camera; and
 - generating zoomed image information in response to the computer instructions and in response to the camera information.
575. A process comprising the acts of:
- storing computer instructions;
 - generating navigation information in response to the computer instructions;
 - generating camera information with a camera; and
 - generating warped image information in response to the computer instructions and in response to the camera information

.576. A process comprising the acts of:
storing computer instructions;
generating inertial navigation information in response to the computer instructions;
generating camera information with a camera;
generating feedback information in response to the computer instructions and in response to the camera information; and
controlling a robot in response to the computer instructions and in response to the camera information.

577. A process comprising the acts of:
storing computer instructions;
generating GPS navigation information in response to the computer instructions;
generating camera information with a camera; and
generating artificial intelligence information in response to the computer instructions and in response to the camera information.

578. A process comprising the acts of:
storing computer instructions;
generating navigation information in response to the computer instructions;
generating camera information with a camera; and
generating feedback information in response to the computer instructions and in response to the camera information.

579. A process comprising the acts of:
storing computer instructions;
generating camera information with a camera; and
generating feedback information in response to the computer instructions and in response to the camera information.

.580. A process comprising the acts of:
storing computer instructions;
generating navigation information in response to the computer instructions;
generating camera information with a camera; and
generating spatially interpolated image information in response to the computer instructions and in response to the camera information.

581. A process comprising the acts of:
storing computer instructions;
generating inertial navigation information in response to the computer instructions;
generating camera information with a camera; and
generating temporally interpolated image information in response to the computer instructions and in response to the camera information.

582. A process comprising the acts of:
storing computer instructions;
generating GPS navigation information in response to the computer instructions;
generating camera information with a camera;
generating pattern recognition information in response to the computer instructions and in response to the camera information; and
generating rotated image information in response to the computer instructions and in response to the camera information.

.583. A process comprising the acts of:
storing computer instructions;
generating inertial navigation information in response to the computer instructions;
generating infra-red information with an infra-red sensor; and
generating data compressed image information in response to the computer instructions and in response to the infra-red information.

9.1 TABLE OF CONTENTS FOR THE INSTANT SPECIFICATION

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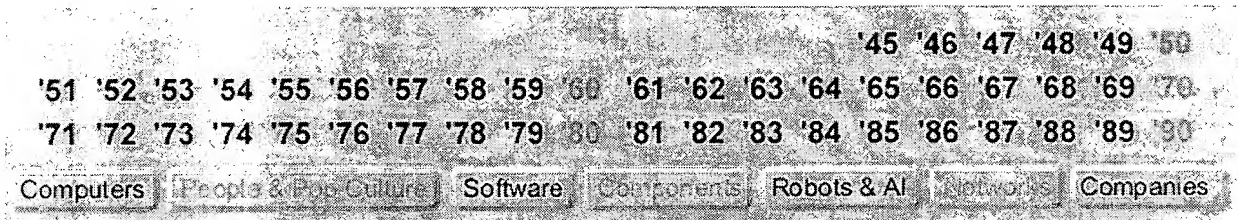
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9.3 COMPUTER HISTORY MUSEUM - TIMELINE



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Timeline



Computers



ENIAC

Computers In February, the public got its first glimpse of the ENIAC, a machine built by John Mauchly and J. Presper Eckert that improved by 1,000 times on the speed of its contemporaries.

Start of project: 1943

Completed: 1946

Programmed: plug board and switches

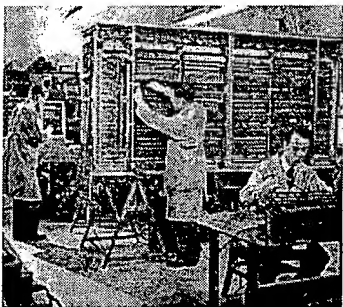
Speed: 5,000 operations per second

Input/output: cards, lights, switches, plugs

Floor space: 1,000 square feet

Project leaders: John Mauchly and J. Presper Eckert.

[More from 1946 -->](#)

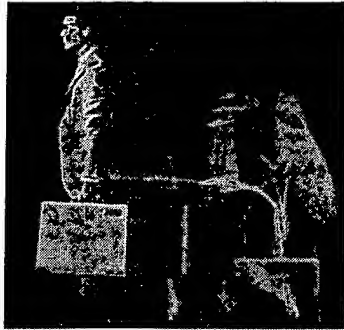


AVIDAC

Computers An inspiring summer school on computing at the University of Pennsylvania's Moore School of Electrical Engineering stimulated construction of stored-program computers at universities and research institutions. This free, public set of lectures inspired the EDSAC, BINAC, and, later, IAS machine clones like the AVIDAC. Here, Warren Kelleher completes the wiring of the arithmetic unit components of the AVIDAC at Argonne National Laboratory. Robert Dennis installs the inter-unit wiring as James Woody Jr. adjusts the deflection control circuits of the memory unit.

[More from 1946 -->](#)

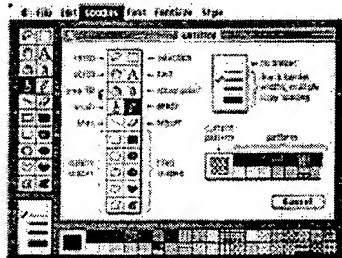
Computers IBM's Selective Sequence Electronic Calculator computed scientific data in public display near the company's Manhattan headquarters. Before its decommissioning in 1952, the SSEC produced the moon-



Compaq PC clone

With the introduction of its PC clone, Compaq launched a market for IBM-compatible computers that by 1996 had achieved a 83-percent share of the personal computer market. Designers reverse-engineered the Compaq clone, giving it nearly 100-percent compatibility with the IBM.

[More from 1983 -->](#)



Apple Macintosh

Computers Apple Computer launched the Macintosh, the first successful mouse-driven computer with a graphic user interface, with a single \$1.5 million commercial during the 1984 Super Bowl. Based on the Motorola 68000 microprocessor, the Macintosh included many of the Lisa's features at a much more affordable price: \$2,500.

Apple's commercial played on the theme of George Orwell's "1984" and featured the destruction of Big Brother with the power of personal computing found in a Macintosh. Applications that came as part of the package included MacPaint, which made use of the mouse, and MacWrite, which demonstrated WYSIWYG (What You See Is What You Get) word processing.

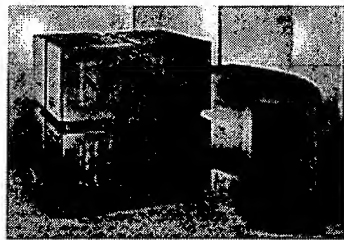
[More from 1984 -->](#)



IBM PC Jr.

Computers IBM released its PC Jr. and PC-AT. The PC Jr. failed, but the PC-AT, several times faster than original PC and based on the Intel 80286 chip, claimed success with its notable increases in performance and storage capacity, all for about \$4,000. It also included more RAM and accommodated high-density 1.2-megabyte 5 1/4-inch floppy disks.

[More from 1984 -->](#)



Connection Machine

Computers Daniel Hillis of Thinking Machines Corp. moved artificial intelligence a step forward when he developed the controversial concept of massive parallelism in the Connection Machine. The machine used 16,000 processors and could complete several billion operations per second. Each processor had its own small memory linked with others through a flexible network that users could alter by reprogramming rather than rewiring.

The machine's system of connections and switches let processors broadcast information and requests for help to other processors in a simulation of brainlike associative recall. Using this system, the machine could work faster than any other at the time on a problem that could be parceled out among the many processors.

[More from 1986 -->](#)

9.4 MOTOROLA INC. "SHOTTKY TTL DATA BOOK"

CITED IN THE INSTANT APPLICATION

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LS/ALS/FAST

Circuit Characteristics

Design Considerations
Symbol Definitions and Testing

LS Data Sheets

SCHOTTKY TTL

ALS Data Sheets

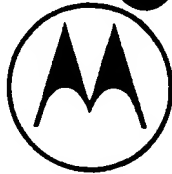
FAST Data Sheets

RAM/PROM Data Sheets

Reliability Data

Package Outlines





MOTOROLA

SCHOTTKY TTL

Prepared by
Technical Information Center

Low Power Schottky (LSTTL) has become the industry standard logic in recent years, replacing the original 7400 TTL with lower power and higher speeds. In addition to offering the standard LS TTL circuits, Motorola offers the Advanced Low Power Schottky TTL family (ALS) and the FAST Schottky TTL family. Complete specifications for each of these families are provided in data sheet form. Functional selector guides not only provide an overview of already introduced devices but planned introduction dates of new products.

This book also provides data sheets for TTL RAMs/PROMs and information regarding circuit characteristics, design considerations and testing, reliability data and package outlines.

Motorola reserves the right to make changes to any product herein to improve reliability, function or design. Motorola does not assume any liability arising out of the application or use of any product or circuit described herein; neither does it convey any license under its present patent rights nor the rights of others.

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| SN54LS/74LS621 | Octal Transceiver with Storage, Open-Collector | 4-330 |
| SN54LS/74LS622 | Octal Transceiver with Storage, Open-Collector | 4-330 |
| SN54LS/74LS623 | Octal Transceiver with Storage, 3-State | 4-330 |
| SN54LS/74LS640 | Octal Bus Transceiver with 3-State Output | 4-334 |
| SN54LS/74LS641 | Octal Bus Transceiver with 3-State Output | 4-334 |
| SN54LS/74LS642 | Octal Bus Transceiver with 3-State Output | 4-334 |
| SN54LS/74LS643 | Octal Bus Transceiver, True, Inverting, 3-State | 4-334 |
| SN54LS/74LS644 | Octal Bus Transceiver, True, Inverting, Open-Collector | 4-334 |
| SN54LS/74LS645 | Octal Bus Transceiver with 3-State Output | 4-334 |
| SN54LS/74LS668 | Synchronous 4-Bit Up/Down Decade Counter | 4-338 |
| SN54LS/74LS669 | Synchronous 4-Bit Up/Down Binary Counter | 4-338 |
| SN54LS/74LS670 | 4 x 4 Register File, 3-State | 4-343 |
| SN54LS/74LS673 | 16-Bit Shift Register, 3-State | 4-347 |
| SN54LS/74LS674 | 16-Bit Shift Register, 3-State | 4-347 |
| SN54LS/74LS682 | 8-Bit Magnitude Comparator, 3-State | 4-351 |
| SN54LS/74LS683 | 8-Bit Magnitude Comparator, Open-Collector | 4-351 |
| SN54LS/74LS684 | 8-Bit Magnitude Comparator, 3-State | 4-351 |
| SN54LS/74LS685 | 8-Bit Magnitude Comparator, Open-Collector | 4-351 |
| SN54LS/74LS686 | 8-Bit Magnitude Comparator with Enable, 3-State | 4-351 |
| SN54LS/74LS687 | 8-Bit Magnitude Comparator with Enable, Open-Collector | 4-351 |
| SN54LS/74LS688 | 8-Bit Magnitude Comparator, 3-State | 4-351 |
| SN54LS/74LS689 | 8-Bit Magnitude Comparator, Open-Collector | 4-351 |
| SN54LS/74LS716 | Programmable Decade Counter (MC4016) | 4-358 |
| SN54LS/74LS718 | Programmable Binary Counter (MC4018) | 4-358 |
| SN74LS724 | Voltage Controlled Oscillator | 4-369 |
| SN54LS/74LS748 | 8-Input to 3-Line Priority Encoder (Glitchless) | 4-111 |
| SN74LS783 | Synchronous Address Multiplexer (MC6883) | 4-372 |
| SN54LS/74LS795 | Octal Buffer (81LS95), 3-State | 4-397 |
| SN54LS/74LS796 | Octal Buffer (81LS96), 3-State | 4-397 |
| SN54LS/74LS797 | Octal Buffer (81LS97), 3-State | 4-397 |
| SN54LS/74LS798 | Octal Buffer (81LS98), 3-State | 4-397 |
| SN54LS/74LS848 | 8-Input to 3-Line Priority Encoder, 3-State (Glitchless) | 4-276 |

Selection Information LS/ALS/FAST

SCHOTTKY TTL



TTL in Perspective

Since its introduction, TTL has become the most popular digital logic family. It has evolved from gold doped saturated logic, to Schottky clamped logic and finally to Advanced Schottky clamped logic. The popularity of TTL stems from its ease of use, low cost, medium-to-high speed operation, and good output drive capability.

Motorola offers three Schottky clamped TTL logic families — LS, ALS, and FAST™. All three families are pin and functionally compatible and can easily be combined in a system to achieve maximum performance at minimum cost.

LS, Low-Power Schottky, is currently the largest and most popular of the three. It is low-cost and provides moderate speed at low power.

ALS, Advanced Low-Power Schottky, offers an im-

proved speed — power product compared to LS as a result of advanced MOSAIC (oxide isolated) processing. Other important features of ALS include improved noise margins, reduced input currents, and superior line driving characteristics.

FAST™, another advanced Schottky TTL line, offers a 20-to-30 percent improvement in speed over standard Schottky logic at about 20 percent of the power. As with ALS, FAST™ offers improved noise margins, reduced input currents and superior line driving characteristics. Additionally, FAST designs incorporate powerdown circuitry on three-state outputs, and buffered outputs on all storage devices. These design improvements provide the logic designer with additional flexibility and more reliable system operation.

TTL Family Comparisons

General Characteristics for Schottky TTL Logic

(ALL MAXIMUM RATINGS)

| Characteristic | Symbol | LS | | ALS | | | FAST | | Units |
|--|---------------------------------|-------------|-------------|-------------|-------------|-------------|--------------|--------------|-------|
| | | 54LSxxx | 74LSxxx | 54ALSxxx | 74ALSxxx | | 54Fxxx | 74Fxxx | |
| Operating Voltage Range | VCC | 5 ± 10% | 5 ± 5% | 5 ± 10% | 5 ± 10% | 5 ± 5% | 5 ± 10% | 5 ± 5% | Vdc |
| Operating Temperature Range | TA | -55 to 125 | 0 to 70 | -55 to 125 | 0 to 70 | 0 to 70 | -55 to 125 | 0 to 70 | °C |
| Input Current | I _{IN} I _{IH} | 20 | 20 | 20 | 20 | 20 | 20 | 20 | μA |
| | I _{IL} | -400 | -400 | -100 | -100 | -100 | -600 | -600 | |
| Output Drive Standard Output | I _{OH} | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -1.0 | -1.0 | mA |
| | I _{OL} | 4.0 | 8.0 | 4.0 | 8.0 | 8.0 | 20 | 20 | mA |
| | I _{SC} | -20 to -100 | -20 to -100 | -25 to -150 | -25 to -150 | -25 to -150 | -60 to -150 | -60 to -150 | mA |
| Buffer Output | I _{OH} | -12 | -15 | -12 | -15 | -15 | -12 | -15 | mA |
| | I _{OL} | 12 | 24 | 12 | 24 | 24 | 48 | 64 | mA |
| | I _{SC} | -40 to -225 | -40 to -225 | -50 to -225 | -50 to -225 | -50 to -225 | -100 to -225 | -100 to -225 | mA |
| Buffer Line Driving Capability: Minimum R _L into 2.5 V | | 178 | 84 | 178 | 84 | 84 | 43 | 32 | Ω |
| Minimum R _L into 5.0 V | | 381 | 189 | 381 | 189 | 189 | 95 | 71 | Ω |

Speed/Power Characteristics for Schottky TTL Logic(1)

(ALL TYPICAL RATINGS)

| Characteristic | Symbol | LS | ALS | FAST | Units |
|-------------------------------|------------------|-----|-----|------|-------|
| Quiescent Supply Current/Gate | I _G | 0.4 | 0.2 | 1.1 | mA |
| Power/Gate (Quiescent) | P _G | 2.0 | 1.0 | 5.5 | mW |
| Propagation Delay | t _p | 9.0 | 5.0 | 3.7 | ns |
| Speed Power Product | — | 18 | 5.0 | 19.2 | pJ |
| Clock Frequency (D-F/F) | f _{max} | 33 | 35 | 125 | MHz |
| Clock Frequency (Counter) | f _{max} | 40 | 45 | 125 | MHz |

NOTES: 1. Specifications are shown for the following conditions:

a) VCC = 5.0 Vdc (AC);

b) TA = 25°C

c) C_L = 50 pF for ALS, FAST; 15 pF for LS

FAST is a trademark of Fairchild Camera and Instrument Corporation.
MOSAIC I is a trademark of Motorola Inc.

High Performance ALS-TTL-Compatible Macrocell Arrays

In addition to standard logic lines, Motorola also offers a variety of TTL-compatible Macrocell Arrays. These products provide a means for developing economical custom LSI/VLSI logic circuits. Performance is achieved by the combination of an advanced MOSAIC I (Motorola Oxide-Isolated Self-Aligned Implanted Circuit) oxide isolated bipolar integrated circuit process and a series gated emitter-coupled logic (ECL) macrocell circuit technology. Input and output circuits provide level translation to and from the internal array logic for standard TTL/MOS interface.

Each cell within the arrays contains a number of unconnected transistors and resistors. Stored within a computer are the specifications to automatically interconnect these elements forming SSI/MSI logic cells (rather than simple gates) called macrocells. These macrocells take the form of standard logic blocks such as dual type D flip-flops, dual full adders, quad latches and many other pre-defined "library" functions. Presently, the macrocell library for the ALS-TTL arrays contains more than 80 logic functions.

Generating an LSI/VLSI design is simply a matter of selecting the appropriate macrocells and describing the proper interconnection network to implement the design. Motorola's CAD (Computer-Aided-Design) interface provides automatic placement and routing of the cells (intraconnection of the cell itself is automatically accomplished when placed), full logic and fault-testing

MCA500ALS MCA1300ALS MCA2800ALS

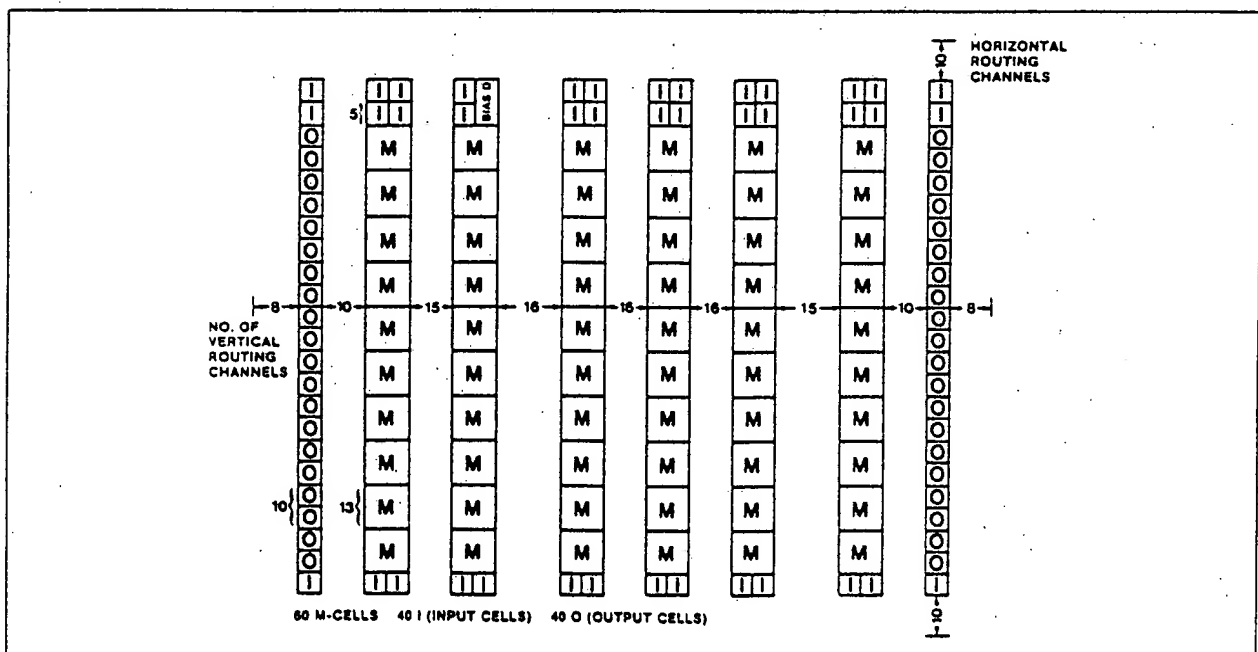
capabilities, AC delay simulations, generation of test tapes and custom metallization to complete the IC processing sequence.

The ability to stockpile fully diffused wafers provides a very fast turnaround time (the time from customer notification of a completed design to delivery of finished parts) of currently nine weeks.

ALS-TTL MCA Selection Chart

| | MCA 500ALS | MCA 1300ALS | MCA 2800ALS |
|----------------------------------|----------------|----------------|----------------|
| Configuration | | | |
| Max Gate Equivalent | 533 | 1280 | 2720 |
| Major Macrocells | 24 | 60 | 130 |
| I/O Ports | 57 | 76 | 120 |
| Input/Interface Cells | 26 | 40 | |
| Output Macrocells | 24 | 40 | |
| Performance | | | |
| Max Gate Delay (M Cell) | 4.0 ns | 3.0 ns | 1.1 ns |
| Max Toggle Frequency | 80 MHz | 80 MHz | 125 MHz |
| Maximum Power Dissipation | 1.0 W | 1.4 W | 2.5 W |
| Packages | | | |
| Dual-In-Line | 28, 40, 48 | 40, 48 | — |
| Chip Carrier | 68 | 68, 84 | 149PG |
| Temperature Range | 0–70°C | 0–70°C | 0–70°C |
| Supply Voltage | 5.0 V \pm 5% | 5.0 V \pm 5% | 5.0 V \pm 5% |
| Availability | Now | Now | Now |

Typical MCA Layout — 1300ALS



LS TTL

SN54LS00 Series (–55 to +125°C)

SN74LS00 Series (0 to +70°C)

Suffix: N . . . Plastic (only 74-series)

J . . . Ceramic (54/74 series)

| Device | Function | Samples | Pins |
|--------|---|---------|------|
| LS00 | Quad 2-Input NAND Gate | A | 14 |
| LS01 | Quad 2-Input NAND Gate, Open-Collector | A | 14 |
| LS02 | Quad 2-Input NOR Gate | A | 14 |
| LS03 | Quad 2-Input NAND Gate, Open-Collector | A | 14 |
| LS04 | Hex Inverter | A | 14 |
| LS05 | Hex Inverter, Open-Collector | A | 14 |
| LS08 | Quad 2-Input AND Gate | A | 14 |
| LS09 | Quad 2-Input AND Gate, Open-Collector | A | 14 |
| LS10 | Triple 3-Input NAND Gate | A | 14 |
| LS11 | Triple 3-Input AND Gate | A | 14 |
| LS12 | Triple 3-Input NAND Gate, Open-Collector | A | 14 |
| LS13 | Dual 4-Input Schmitt Trigger | A | 14 |
| LS14 | Hex Schmitt Trigger | A | 14 |
| LS15 | Triple 3-Input AND Gate, Open-Collector | A | 14 |
| LS20 | Dual 4-Input NAND Gate | A | 14 |
| LS21 | Dual 4-Input AND Gate | A | 14 |
| LS22 | Dual 4-Input NAND Gate, Open-Collector | A | 14 |
| LS26 | Quad 2-Input NAND, High Voltage | A | 14 |
| LS27 | Triple 3-Input NOR Gate | A | 14 |
| LS28 | Quad 2-Input NOR Buffer | A | 14 |
| LS30 | 8-Input NAND Gate | A | 14 |
| LS32 | Quad 2-Input OR Gate | A | 14 |
| LS33 | Quad 2-Input NOR Buffer, Open-Collector | A | 14 |
| LS37 | Quad 2-Input NAND Buffer | A | 14 |
| LS38 | Quad 2-Input NAND Buffer, Open-Collector | A | 14 |
| LS40 | Dual 4-Input NAND Buffer | A | 14 |
| LS42 | 1-of-10 Decoder | A | 16 |
| LS47 | BCD to 7-Segment Decoder/Driver, Open-Collector | A | 16 |
| LS48 | BCD to 7-Segment Decoder/Driver, with Pull-Ups | A | 16 |
| LS49 | BCD to 7-Segment Decoder/Driver, Open-Collector | A | 16 |
| LS51 | Dual AND-OR-INVERT Gate | A | 14 |
| LS54 | 3-2-2-3 Input AND-OR-INVERT Gate | A | 14 |
| LS55 | 2-Wide 4-Input AND-OR-INVERT Gate | A | 14 |
| LS73A | Dual JK Flip-Flop | A | 14 |
| LS74A | Dual D Flip-Flop | A | 14 |
| LS75 | 4-Bit Bi-Stable Latch with Q and \bar{Q} | A | 16 |
| LS76A | Dual JK Flip-Flop | A | 16 |
| LS77 | 4-Bit Bi-Stable Latch | A | 14 |
| LS78A | Dual JK Flip-Flop with Preset | A | 14 |
| LS83A | 4-Bit Full Adder | A | 16 |
| LS85 | 4-Bit Magnitude Comparator | A | 16 |
| LS86 | Quad Exclusive OR Gate | A | 14 |

A = Announced

| Device | Function | Samples | Pins |
|--------|--|---------|------|
| LS90 | Decade Counter | A | 14 |
| LS91 | 8-Bit Shift Register Serial-In/Serial-Out | A | 14 |
| LS92 | Divide-By-12 Counter | A | 14 |
| LS93 | 4-Bit Binary Counter | A | 14 |
| LS95B | 4-Bit Shift Register | A | 14 |
| LS107A | Dual JK Flip-Flop with Clear | A | 14 |
| LS109A | Dual JK Flip-Flop with Preset | A | 16 |
| LS112A | Dual JK Edge-Triggered Flip-Flop | A | 16 |
| LS113A | Dual JK Edge-Triggered Flip-Flop | A | 14 |
| LS114A | Dual JK Edge-Triggered Flip-Flop | A | 14 |
| LS122 | Retriggerable Monostable Multivibrator | A | 14 |
| LS123 | Dual Retriggerable Monostable Multivibrator | A | 16 |
| LS125A | Quad Buffer, Low Enable, 3-State | A | 14 |
| LS126A | Quad Buffer, High Enable, 3-State | A | 14 |
| LS132 | Quad 2-Input Schmitt Trigger | A | 14 |
| LS133 | 13-Input NAND Gate | A | 16 |
| LS136 | Quad Exclusive OR Gate, Open-Collector | A | 14 |
| LS137 | 3-Line to 8-Line Decoder/Demultiplexer | A | 16 |
| LS138 | 1-of-8 Decoder/Demultiplexer | A | 16 |
| LS139 | Dual 1-of-4 Decoder/Demultiplexer | A | 16 |
| LS145 | 1-of-10 Decoder/Driver, Open-Collector | A | 16 |
| LS147 | 10-Line Decimal to 4-Line Priority Encoder | A | 16 |
| LS148 | 8-Input to 3-Line Priority Encoder | A | 16 |
| LS151 | 8-Input Multiplexer | A | 16 |
| LS153 | Dual 4-Input Multiplexer | A | 16 |
| LS155 | Dual 1-of-4 Decoder | A | 16 |
| LS156 | Dual 1-of-4 Decoder, Open-Collector | A | 16 |
| LS157 | Quad 2-Input Multiplexer, Non-Inverting | A | 16 |
| LS158 | Quad 2-Input Multiplexer, Inverting | A | 16 |
| LS160 | BCD Decade Counter, Asynchronous Reset (9310 Type) | A | 16 |
| LS161A | 4-Bit Binary Counter, Asynchronous Reset (9316 Type) | A | 16 |
| LS162A | BCD Decade Counter, Synchronous Reset | A | 16 |
| LS163A | 4-Bit Binary Counter, Synchronous Reset | A | 16 |
| LS164 | 8-Bit Serial-In/Parallel-Out Shift Register | A | 14 |
| LS165 | 8-Bit Parallel-In/Serial-Out Shift Register | A | 16 |
| LS166 | 8-Bit Parallel-In/Serial-Out Shift Register | A | 16 |
| LS168 | Up/Down Decade Counter | A | 16 |
| LS169 | Up/Down Binary Counter | A | 16 |
| LS170 | 4 x 4 Register File, Open-Collector | A | 16 |
| LS173A | 4-Bit D Register, 3-State | A | 16 |
| LS174 | Hex D Flip-Flop with Clear | A | 16 |
| LS175 | Quad D Flip-Flop with Clear | A | 16 |
| LS181 | 4-Bit ALU | A | 24 |
| LS182 | Look Ahead Carry Generator | A | 16 |
| LS183 | Dual Carry/Save Full Adder | A | 14 |
| LS190 | Up/Down Decade Counter | A | 16 |
| LS191 | Up/Down Binary Counter | A | 16 |
| LS192 | Up/Down Decade Counter with Clear | A | 16 |
| LS193 | Up/Down Binary Counter with Clear | A | 16 |
| LS194A | 4-Bit Right/Left Shift Register | A | 16 |
| LS195A | 4-Bit Shift Register (9300 Type) | A | 16 |
| LS196 | Decade Counter, Asynchronously Presetable | A | 14 |
| LS197 | 4-Bit Binary Counter, Asynchronously Presetable | A | 14 |

| Device | Function | Samples | Pins |
|--------|--|---------|------|
| LS221 | Dual One-Shot (Very Stable) | A | 16 |
| LS240 | Octal Bus/Line Driver, Inverting 3-State | A | 20 |
| LS241 | Octal Bus/Line Driver, 3-State | A | 20 |
| LS242 | Quad Bus Transceiver, Inverting, 3-State | A | 14 |
| LS243 | Quad Bus Transceiver, Non-Inverting, 3-State | A | 14 |
| LS244 | Octal Driver, Non-Inverting, 3-State | A | 20 |
| LS245 | Octal Bus Transceiver, Non-Inverting, 3-State | A | 20 |
| LS247 | BCD to 7-Segment Decoder/Driver, Open-Collector | A | 16 |
| LS248 | BCD to 7-Segment Decoder/Driver with Pull-Ups | A | 16 |
| LS249 | BCD to 7-Segment Decoder/Driver, Open-Collector | A | 16 |
| LS251 | 8-Input Multiplexer, 3-State | A | 16 |
| LS253 | Dual 4-Input Multiplexer, 3-State | A | 16 |
| LS256 | Dual 4-Bit Addressable Latch | A | 16 |
| LS257A | Quad 2-Input Multiplexer, Non-Inverting, 3-State | A | 16 |
| LS258A | Quad 2-Input Multiplexer, Inverting 3-State | A | 16 |
| LS259 | 8-Bit Addressable Latch (9334) | A | 16 |
| LS260 | Dual 5-Input NOR Gate | A | 14 |
| LS266 | Quad Exclusive NOR Gate, Open-Collector | A | 14 |
| LS273 | Octal D Flip-Flop with Clear | A | 20 |
| LS279 | Quad Set/Reset Latch | A | 16 |
| LS280 | 8-Bit Odd/Even Parity Generator/Checker | A | 14 |
| LS283 | 4-Bit Full Adder (Rotated LS83A) | A | 16 |
| LS290 | Decade Counter (Divide By 2 and 5) | A | 14 |
| LS293 | 4-Bit Binary Counter | A | 16 |
| LS295A | 4-Bit Shift Register, 3-State | A | 14 |
| LS298 | Quad 2-Multiplexer, with Output Register | A | 16 |
| LS299 | 8-Bit Shift/Storage Register, 3-State | A | 20 |
| LS322A | 8-Bit Shift Register with Sign Extend, 3-State | A | 20 |
| LS323 | 8-Bit Shift/Storage Register, 3-State | A | 20 |
| LS348 | 8-Input to 3-Line Priority Encoder, 3-State | A | 16 |
| LS352 | Dual 4-Multiplexer (Inverting LS153) | A | 16 |
| LS353 | Dual 4-Multiplexer (3-State LS352) | A | 16 |
| LS365A | Hex Buffer, Common Enable, 3-State | A | 16 |
| LS366A | Hex Inverter, Common Enable, 3-State | A | 16 |
| LS367A | Hex Buffer, 4-Bit and 2-Bit, 3-State | A | 16 |
| LS368A | Hex Inverter, 4-Bit and 2-Bit, 3-State | A | 16 |
| LS373 | Octal Transparent Latch, 3-State | A | 20 |
| LS374 | Octal D Flip-Flop, 3-State | A | 20 |
| LS375 | Quad Latch | A | 16 |
| LS377 | Octal D Flip-Flop with Enable | A | 20 |
| LS378 | Hex D Flip-Flop with Enable | A | 16 |
| LS379 | 4-Bit D Flip-Flop with Enable | A | 16 |
| LS385 | Quad 4-Bit Adder/Subtractor | A | 20 |
| LS386 | 2-Input Quad/Exclusive OR Gate | A | 14 |
| LS390 | Dual Decade Counter | A | 16 |
| LS393 | Dual 4-Bit Binary Counter | A | 14 |
| LS395 | 4-Bit Shift Register, 3-State | A | 16 |
| LS398 | Quad 2-Input Multiplexer with Output Register | A | 20 |
| LS399 | Quad 2-Input Multiplexer with Output Register | A | 16 |

| Device | Function | Samples | Pins |
|--------|--|---------|------|
| LS490 | Dual Decade Counter | A | 16 |
| LS540 | Octal Buffer/Line Driver, 3-State | A | 20 |
| LS541 | Octal Buffer/Line Driver, 3-State | A | 20 |
| LS568 | Decade Up/Down Counter, 3-State | A | 20 |
| LS569 | Binary Up/Down Counter, 3-State | A | 20 |
| LS604 | 16-to-8 Multiplexer, 3-State | A | 28 |
| LS605 | 16-to-8 Multiplexer, Open-Collector | A | 28 |
| LS606 | 16-to-8 Multiplexer, 3-State | A | 28 |
| LS607 | 16-to-8 Multiplexer, Open-Collector | A | 28 |
| LS620 | Octal Transceiver with Storage, 3-State | A | 20 |
| LS621 | Octal Transceiver with Storage, Open-Collector | A | 20 |
| LS622 | Octal Transceiver with Storage, Open-Collector | A | 20 |
| LS623 | Octal Transceiver with Storage, 3-State | A | 20 |
| LS640 | Octal Bus Transceiver, Inverting, 3-State | A | 20 |
| LS641 | Octal Bus Transceiver, Non-Inverting, Open-Collector | A | 20 |
| LS642 | Octal Bus Transceiver, Inverting, Open-Collector | A | 20 |
| LS643 | Octal Bus Transceiver, True, Inverting, 3-State | A | 20 |
| LS644 | Octal Bus Transceiver, True, Inverting, Open-Collector | A | 20 |
| LS645 | Octal Bus Transceiver, Non-Inverting, 3-State | A | 20 |
| LS668 | Synchronous 4-Bit Up/Down Decade Counter | A | 16 |
| LS669 | Synchronous 4-Bit Up/Down Binary Counter | A | 16 |
| LS670 | 4 x 4 Register File, 3-State | A | 16 |
| LS673 | 16-Bit Serial-In/Serial-Out Shift Register, 3-State | A | 24 |
| LS674 | 16-Bit Parallel-In/Serial-Out Shift Register, 3-State | A | 24 |
| LS682 | 8-Bit Magnitude Comparator | A | 20 |
| LS683 | 8-Bit Magnitude Comparator, Open-Collector | A | 20 |
| LS684 | 8-Bit Magnitude Comparator | A | 20 |
| LS685 | 8-Bit Magnitude Comparator, Open-Collector | A | 20 |
| LS686 | 8-Bit Magnitude Comparator with Enable | A | 24 |
| LS687 | 8-Bit Magnitude Comparator with Enable | A | 24 |
| LS688 | 8-Bit Magnitude Comparator | A | 20 |
| LS689 | 8-Bit Magnitude Comparator, Open-Collector | A | 20 |
| LS716 | Programmable Decade Counter (MC4016) | A | 16 |
| LS718 | Programmable Binary Counter (MC4018) | A | 16 |
| LS724 | Voltage Controlled Multivibrator | A | 8 |
| LS748 | 8-Input to 3-Line Priority Encoder | A | 16 |
| LS783* | Synchronous Address Multiplexer (MC6883) | A | 40 |
| LS795 | Octal Buffer (81LS95), 3-State | A | 20 |
| LS796 | Octal Buffer (81LS96), 3-State | A | 20 |
| LS797 | Octal Buffer (81LS97), 3-State | A | 20 |
| LS798 | Octal Buffer (81LS98), 3-State | A | 20 |
| LS848 | 8-Input to 3-Line Priority Encoder, 3-State | A | 16 |

*74LS only.

FAST TTL

MC54F00 Series (–55 to +125°C)

MC74F00 Series (0 to +70°C)

Suffix: N . . . Plastic (only 74-series)

J . . . Ceramic (54/74 series)

| Device | Function | Samples | Pins |
|--------|---|---------|------|
| F00 | Quad 2-Input NAND Gate | A | 14 |
| F02 | Quad 2-Input NOR Gate | A | 14 |
| F04 | Hex Inverter | A | 14 |
| F08 | Quad 2-Input AND Gate | A | 14 |
| F10 | Triple 3-Input NAND Gate | A | 14 |
| F11 | Triple 3-Input AND Gate | A | 14 |
| F20 | Dual 4-Input NAND Gate | A | 14 |
| F32 | Quad 2-Input OR Gate | A | 14 |
| F64 | 4-2-2-3 Input AND-OR-INVERT Gate | A | 14 |
| F74 | Dual D Flip-Flop | A | 14 |
| F86 | Quad Ex/OR Gate | 3Q83 | 14 |
| F109 | Dual J-K Flip-Flop w/Preset | A | 16 |
| F112 | Dual J-K Flip-Flop | 3Q83 | 16 |
| F113 | Dual J-K Flip-Flop | 3Q83 | 14 |
| F114 | Dual J-K Flip-Flop | 3Q83 | 14 |
| F138 | 1-of-8 Decoder/Demultiplexer | 3Q83 | 16 |
| F139 | Dual 1-of-4 Decoder/Demultiplexer | 3Q83 | 16 |
| F151 | 8-Input Multiplexer | 4Q83 | 16 |
| F153 | Dual 4-Input Multiplexer | A | 16 |
| F157 | Quad 2-Input Multiplexer | 4Q83 | 16 |
| F158 | Quad 2-Input Multiplexer | 4Q83 | 16 |
| F160 | BCD Decade Counter, Asynchronous Reset | 4Q83 | 16 |
| F161 | 4-Bit Binary Counter, Asynchronous Reset | 4Q83 | 16 |
| F162 | BCD Decade Counter, Synchronous Reset | 4Q83 | 16 |
| F163 | 4-Bit Binary Counter, Synchronous Reset | 4Q83 | 16 |
| F168 | Up/Down Decade Counter | 1H84 | 16 |
| F169 | Up/Down Binary Counter | 1H84 | 16 |
| F174 | Hex D Flip-Flop | 3Q83 | 16 |
| F175 | Quad D Flip-Flop | 3Q83 | 16 |
| F181 | 4-Bit ALU | 1H84 | 24 |
| F182 | Look Ahead Carry Generator | 1H84 | 16 |
| F189 | 64-Bit RAM/3-State | 2H84 | 16 |
| F190 | Up/Down Decade Counter | 4Q83 | 16 |
| F191 | Up/Down Binary Counter | 4Q83 | 16 |
| F192 | Up/Down Decade Counter with Clear | 4Q83 | 16 |
| F193 | Up/Down Binary Counter with Clear | 4Q83 | 16 |
| F194 | Universal Shift Register | 4Q83 | 16 |
| F195 | 4-Bit Shift Register | 4Q83 | 16 |
| F240 | Octal Bus/Line Driver/Inverting/3-State | A | 20 |
| F241 | Octal Bus/Line Driver/3-State | A | 20 |
| F242 | Quad Bus Transceiver/Inverting/3-State | A | 14 |
| F243 | Quad Bus Transceiver/Non-Inverting/3-State | A | 14 |
| F244 | Octal Bus Driver/Non-Inverting/3-State | A | 20 |
| F245 | Octal Bus Transceiver | A | 20 |
| F251 | 8-Input Multiplexer/3-State | 4Q83 | 16 |
| F253 | Dual 4-Input Multiplexer/3-State | A | 16 |
| F257 | Quad 2-Input Multiplexer/3-State | 4Q83 | 16 |
| F258 | Quad 2-Input Multiplexer, Inverting/3-State | 4Q83 | 16 |
| F280 | 9-Bit Odd/Even Parity Gen/Checker | 2H84 | 14 |
| F283 | 4-Bit Full Adder | 2H84 | 20 |
| F289 | 64-Bit RAM, Open-Collector | 2H84 | 16 |
| F299 | 8-Bit Shift/Store Register | 1H84 | 20 |
| F323 | 8-Bit Universal Shift/Storage Register | 1H84 | 20 |
| F350 | 4-Bit Shifter/3-State | 1H84 | 16 |
| F352 | Dual 4-Input Multiplexer | A | 16 |
| F353 | Dual 4-Input Multiplexer/3-State | A | 20 |

| Device | Function | Samples | Pins |
|--------|--|---------|------|
| F373 | Octal Transparent Latch/3-State | 3Q83 | 16 |
| F374 | Octal D Flip-Flop/3-State | A | 16 |
| F378 | Hex Parallel D Register w/Enable | 3Q83 | 20 |
| F379 | Quad Parallel Register w/Enable | 3Q83 | 20 |
| F381 | 4-Bit ALU | 1H84 | 20 |
| F382 | 4-Bit ALU | 1H84 | 20 |
| F521 | Octal Comparator | 1Q84 | 20 |
| F533 | Octal Transparent Latch/3-State | A | 20 |
| F534 | Octal D Flip-Flop/3-State | A | 20 |
| F537 | 1-of-10 Decoder/3-State | 1H84 | 20 |
| F538 | 1-of-8 Decoder/3-State | 1H84 | 20 |
| F539 | 1-of-4 Decoder/3-State | 1H84 | 20 |
| F620 | Octal Bus Transceiver/Inverting/3-State | 3Q83 | 20 |
| F623 | Octal Bus Transceiver/3-State | 3Q83 | 20 |
| F640 | Octal Bus Transceiver/Inverting/3-State | 3Q83 | 20 |
| F643 | Octal Bus Transceiver/Inverting/True/3-State | 3Q83 | 20 |
| F2960 | Error Detection and Correction Unit (EDAC) | 3Q83 | 48 |
| F2961 | EDAC Bus Buffer, Inverting | 1H84 | 24 |
| F2962 | EDAC Bus Buffer, Non-Inverting | 1H84 | 24 |
| F2968 | Dynamic Memory Controller | 4Q83 | 48 |
| F2969 | Memory Timing Controller w/EDAC | 4Q83 | 48 |
| F2970 | Memory Timing Controller w/o EDAC | 4Q83 | 24 |

ALS TTL

SN54ALS00 Series (–55 to +125°C)

SN74ALS00 Series (0 to +70°C)

Suffix: N . . . Plastic (only 74-series)

J . . . Ceramic (54/74 series)

| Device | Function | Samples | Pins |
|--------|--|---------|------|
| ALS00 | Quad 2-Input NAND Gate | A | 14 |
| ALS01 | Quad 2-Input NAND Gate, Open-Collector | 4Q83 | 14 |
| ALS02 | Quad 2-Input NOR Gate | A | 14 |
| ALS03 | Quad 2-Input NAND Gate, Open-Collector | A | 14 |
| ALS04 | Hex Inverter | A | 14 |
| ALS05 | Hex Inverter, Open-Collector | A | 14 |
| ALS08 | Quad 2-Input AND Gate | A | 14 |
| ALS09 | Quad 2-Input AND Gate, Open-Collector | A | 14 |
| ALS10 | Triple 3-Input NAND Gate | A | 14 |
| ALS11 | Triple 3-Input AND Gate | A | 14 |
| ALS12 | Triple 3-Input NAND Gate, Open-Collector | A | 14 |
| ALS13 | Dual 4-Input Schmitt Trigger | 4Q83 | 14 |
| ALS14 | Hex Schmitt Trigger | 4Q83 | 14 |
| ALS15 | Triple 3-Input NAND Gate, Open-Collector | A | 14 |
| ALS20 | Dual 4-Input NAND Gate | A | 14 |
| ALS21 | Dual 4-Input AND Gate | A | 14 |
| ALS22 | Dual 4-Input NAND Gate, Open-Collector | A | 14 |
| ALS27 | Triple 3-Input NOR Gate | A | 14 |
| ALS28 | Quad 2-Input NOR Buffer | 4Q83 | 14 |
| ALS32 | Quad 2-Input OR Gate | 4Q83 | 14 |
| ALS33 | Quad 2-Input NOR Buffer, Open-Collector | 4Q83 | 14 |

NUMERIC LISTING (continued)

| Device | Function | Samples | Pins |
|--------|--|---------|------|
| ALS37 | Quad 2-Input NAND Buffer | A | 14 |
| ALS38 | Quad 2-Input NAND Buffer, Open-Collector | A | 14 |
| ALS40 | Dual 4-Input NAND Buffer | 4Q83 | 14 |
| ALS51 | Dual 2-Wide, 2-3-Input AND-OR-INVERT Gate | A | 14 |
| ALS55 | 2-Wide, 4-Input AND-OR-INVERT Gate | A | 14 |
| ALS74 | Dual D Flip-Flop | A | 14 |
| ALS91 | 8-Bit Serial-In/Serial-Out Shift Register | 1H84 | 14 |
| ALS109 | Dual J-K Flip-Flop w/Preset | 4Q83 | 16 |
| ALS132 | Quad 2-Input Schmitt Trigger | 4Q83 | 14 |
| ALS138 | 1-of-8 Decoder/Demultiplexer | 4Q83 | 16 |
| ALS139 | Dual 1-of-4 Decoder/Demultiplexer | 4Q83 | 16 |
| ALS151 | 8-Input Multiplexer | 3Q83 | 16 |
| ALS153 | Dual 4-Input Multiplexer | 1Q84 | 16 |
| ALS157 | Quad 2-Input Multiplexer/Non-Inverting | A | 16 |
| ALS158 | Quad 2-Input Multiplexer/Inverting | A | 16 |
| ALS160 | BCD Decade Counter/Asynchronous Reset (9310 Type) | A | 16 |
| ALS161 | 4-Bit Binary Counter, Asynchronous Reset (9316 Type) | A | 16 |
| ALS162 | BCD Decade Counter/Synchronous Reset | A | 16 |
| ALS163 | 4-Bit Binary Counter/Synchronous Reset | A | 16 |
| ALS164 | 8-Bit Serial-In/Parallel-Out Shift Register | 1H84 | 14 |
| ALS168 | 4-Bit Up/Down Decade Counter/ Synchronous Reset | 4Q83 | 16 |
| ALS169 | 4-Bit Up/Down Binary Counter/ Synchronous Reset | 4Q83 | 16 |
| ALS190 | Up/Down Decade Counter | A | 16 |
| ALS191 | Up/Down Binary Counter | A | 16 |
| ALS192 | Up/Down Decade Counter w/Clear | A | 16 |
| ALS193 | Up/Down Binary Counter w/Clear | A | 16 |
| ALS238 | 1-of-8 Decoder/Demultiplexer/(Active High) | 4Q83 | 16 |
| ALS239 | Dual 1-of-4 Decoder/Demultiplexer/ (Active High) | 4Q83 | 16 |
| ALS240 | Octal Bus/Line Driver/Inverting/3-State | A | 20 |
| ALS241 | Octal Bus/Line Driver/3-State | A | 20 |
| ALS242 | Quad Bus Transceiver/Inverting/3-State | A | 14 |
| ALS243 | Quad Bus Transceiver/Non-Inverting/ 3-State | A | 14 |
| ALS244 | Octal Driver/Non-Inverting/3-State | A | 20 |
| ALS245 | Octal Bus Transceiver/Non-Inverting/ 3-State | A | 20 |
| ALS251 | 8-Input Multiplexer/3-State | 3Q83 | 16 |
| ALS253 | Dual 4-Input Multiplexer/3-State | 1H84 | 16 |
| ALS257 | Quad 2-Input Multiplexer/Non-Inverting/ 3-State | 1H84 | 16 |
| ALS258 | Quad 2-Input Multiplexer/Inverting/3-State | 1H84 | 16 |
| ALS273 | Octal D Flip-Flop w/Clear | A | 20 |
| ALS352 | Dual 4-Multiplexer/Inverting ALS153 | 1H84 | 16 |
| ALS353 | Dual 4-Multiplexer/3-State ALS352 | 1H84 | 16 |
| ALS373 | Octal Transparent Latch/3-State | 3Q83 | 20 |
| ALS374 | Octal D Flip-Flop/3-State | 3Q83 | 20 |
| ALS377 | Octal D Flip-Flop w/Enable | A | 20 |
| ALS533 | Octal Transparent Latch/Inverting | 1H84 | 20 |
| ALS534 | Octal D-Type Flip-Flop/Inverting | 1H84 | 20 |
| ALS537 | 1-of-10 Decoder/3-State | 1H84 | 20 |
| ALS538 | 1-of-8 Decoder/3-State | 1H84 | 20 |
| ALS539 | Dual 1-of-4 Decoder/3-State | 1H84 | 20 |
| ALS540 | Octal Buffer/3-State | 4Q83 | 20 |
| ALS541 | Octal Buffer/3-State | 4Q83 | 20 |
| ALS560 | 4-Bit Decade Counter/3-State | A | 20 |
| ALS561 | 4-Bit Binary Counter/3-State | A | 20 |
| ALS563 | 8-Bit Latch/3-State | 1H84 | 20 |
| ALS564 | Octal D Flip-Flop/3-State | 1H84 | 20 |
| ALS568 | Decade Up/Down Counter 3-State | 4Q83 | 20 |
| ALS569 | Binary Up/Down Counter 3-State | 4Q83 | 20 |
| ALS573 | Octal Transparent Latch 3-State | 1H84 | 20 |
| ALS574 | Octal D Flip-Flop/3-State | 1H84 | 20 |

| Device | Function | Samples | Pins |
|--------|---|--------------|------|
| ALS575 | Octal D Flip-Flop/Synchronous Clear/ 3-State | 1H84 | 20 |
| ALS576 | Octal D Flip-Flop/Inverting/3-State | 1H84 | 20 |
| ALS577 | Octal D Flip-Flop/Inverting/Synchronous Clear/3-State | 1H84 | 20 |
| ALS580 | Octal Transparent Latch/Inverting/3-State | 1H84 | 20 |
| ALS620 | Octal Transceiver w/Storage/3-State | A | 20 |
| ALS621 | Octal Transceiver w/Storage/ Open-Collector | A | 20 |
| ALS622 | Octal Transceiver w/ Storage/ Open-Collector | A | 20 |
| ALS623 | Octal Transceiver w/Storage/3-State | A | 20 |
| ALS638 | Octal Bus Transceiver/Inverting/3-State | A | 20 |
| ALS639 | Octal Bus Transceiver/3-State | A | 20 |
| ALS640 | Octal Bus Transceiver/Inverting/3-State | A | 20 |
| ALS641 | Octal Bus Transceiver/Non-Inverting/ Open-Collector | A | 20 |
| ALS642 | Octal Bus Transceiver/Inverting/ Open-Collector | A | 20 |
| ALS643 | Octal Bus Transceiver/True/Inverting/3-State | A | 20 |
| ALS644 | Octal Bus Transceiver/True/Inverting/ Open-Collector | A | 20 |
| ALS646 | Octal Transceiver/Latch/Multiplexer/ Non-Inverting/3-State | 1H84 | 24 |
| ALS647 | Octal Transceiver/Latch/Multiplexer/ Non-Inverting/Open-Collector | 1H84 | 24 |
| ALS648 | Octal Transceiver/Latch/Multiplexer/ Inverting/3-State | 1H84 | 24 |
| ALS649 | Octal Transceiver/Latch/Multiplexer/ Inverting/Open-Collector | 1H84 | 24 |
| ALS651 | Octal Bus Transceiver/Register/3-State | 1H84 | 24 |
| ALS652 | Octal Bus Transceiver/Register/3-State | 1H84 | 24 |
| ALS653 | Octal Bus Transceiver/Register | 1H84 | 24 |
| ALS654 | Octal Bus Transceiver/Register | 1H84 | 24 |
| ALS671 | Bidirectional Shift Register/Latch/ Multiplexer/3-State | 4Q83 | 20 |
| ALS672 | Bidirectional Shift Register/Latch/ Multiplexer/3-State | 4Q83 | 20 |
| ALS690 | Decade Counter/Latch/Multiplexer/ Asynchronous Reset/3-State | A | 20 |
| ALS691 | Binary Counter/Latch/Multiplexer/ Asynchronous Reset/3-State | A | 20 |
| ALS692 | Decade Counter/Latch/Multiplexer/ Synchronous Reset/3-State | A | 20 |
| ALS693 | Binary Counter/Latch/Multiplexer/ Synchronous Reset/3-State | A | 20 |
| ALS694 | Decade Counter/Latch/Multiplexer/ Synchronous/Asynchronous Reset/ 3-State | A | 20 |
| ALS695 | Binary Counter/Latch/Multiplexer/ Synchronous/Asynchronous Reset/ 3-State | A | 20 |
| ALS696 | Decade Counter/Register/Multiplexer/ 3-State | 4Q83 | 20 |
| ALS697 | Binary Counter/Register/Multiplexer/3-State | 4Q83 | 20 |
| ALS698 | Decade Counter/Register/Multiplexer/ 3-State | 4Q83 | 20 |
| ALS699 | Binary Counter/Register/Multiplexer/3-State | 4Q83 | 20 |
| ALS790 | Error Detection and Correction Circuit | see F2960 | |
| ALS873 | Octal Transparent Latch | 2H84 | 24 |
| ALS874 | Octal D Flip-Flop | 2H84 | 24 |
| ALS876 | Octal D Flip-Flop/Inverting | 2H84 | 24 |
| ALS878 | Dual 4-Bit D Flip-Flop/Synchronous Clear 3-State | 2H84 | 24 |
| ALS879 | Dual 4-Bit D Flip-Flop/Inverting Synchronous Clear 3-State | 2H84 | 24 |
| ALS880 | Octal Transparent Latch-Inverting | 2H84 | 24 |

1

TTL Memories

MCM76xxx Series PROM

MCM93xxx Series RAM

*Suffix: D . . . Ceramic DIP

P . . . Plastic DIP

C . . . 0 to +75°C (Commercial)

M . . . -55 to +125°C (Military)

*Example: MCM7621DC, MCM7621DM, etc.

| Device | Function | TAA (ns) | Samples | Pins |
|-----------|-----------------------------------|-------------|---------|------|
| MCM27S25 | 512 x 8 PROM, 3-State, Registered | 30/15* | 2Q84 | 24 |
| MCM27S27 | 512 x 8 PROM, 3-State, Registered | 35/20* | 2Q84 | 22 |
| MCM27S35 | 1k x 8 PROM, 3-State, Registered | 35/20* | 2Q84 | 24 |
| MCM27S37 | 1k x 8 PROM, 3-State, Registered | 35/20* | 2Q84 | 24 |
| MCM27S45 | 2k x 8 PROM, 3-State, Registered | 35/20* | 1Q84 | 24 |
| MCM27S47 | 2k x 8 PROM, 3-State, Registered | 35/20* | 1Q84 | 24 |
| MCM7621 | 512 x 4 PROM, 3-State | 70 | A | 16 |
| MCM7621A | 512 x 4 PROM, 3-State | 60 | A | 16 |
| MCM7641 | 512 x 8 PROM, 3-State | 70 | A | 24 |
| MCM7641A | 512 x 8 PROM, 3-State | 60 | A | 24 |
| MCM7643 | 1024 x 4 PROM, 3-State | 70 | A | 18 |
| MCM7643A | 1024 x 4 PROM, 3-State | 50 | A | 18 |
| MCM7649 | 512 x 8 PROM, 3-State | 70 | A | 20 |
| MCM7649A | 512 x 8 PROM, 3-State | 50 | 3Q83 | 20 |
| MCMXXXXX | 512 x 8 PROM, 3-State | 35 | 1984 | 20 |
| MCM7681 | 1024 x 8 PROM, 3-State | 70 | A | 24 |
| MCM7681A | 1024 x 8 PROM, 3-State | 50 | 3Q83 | 24 |
| MCMXXXXXX | 1k x 8 PROM, 3-State | 35 | 1984 | 24 |
| MCM7685 | 2048 x 4 PROM, 3-State | 70 | A | 18 |
| MCM7685A | 2048 x 4 PROM, 3-State | 55 | A | 18 |
| MCM76161 | 2048 x 8 PROM, 3-State | 70 | A | 24 |
| MCM76161A | 2048 x 8 PROM, 3-State | 60 | A | 24 |
| MCMXXXXXX | 2k x 8 PROM, 3-State | 35 | 1984 | 24 |
| MCM76165A | 4096 x 4 PROM, 3-State | 50 | 3Q83 | 20 |
| MCM93422 | 256 x 4 RAM, 3-State | 45 | A | 22 |
| MCM93L422 | 256 x 4 RAM, 3-State | 60 | A | 22 |
| MCM93415 | 1024 x 1 RAM, Open-Collector | 45 | A | 18 |
| MCM93425 | 1024 x 1 RAM, 3-State | 45 | A | 18 |

*For Registered PROMs, t_{SA}, t_{PHL} (Address setup time propagation delay, clock to output)

Functional Selection

Abbreviations

S = Synchronous
A = Asynchronous
B = Both Synchronous and Asynchronous

2S = 2-State Output
3S = 3-State Output
OC = Open-Collector Output

P = Planned (See Numeric List for latest availability status.)

Inverters

| Description | Type of Output | No. | LS | ALS | FAST |
|-------------|----------------|-----|----|-----|------|
| Hex | 2S | 04 | X | X | X |
| | OC | 05 | X | X | |

AND Gates

| Description | Type of Output | No. | LS | ALS | FAST |
|----------------|----------------|-----|----|-----|------|
| Quad 2-Input | 2S | 08 | X | X | X |
| | OC | 09 | X | X | |
| Triple 3-Input | 2S | 11 | X | X | X |
| | OC | 15 | X | X | |
| Dual 4-Input | 2S | 21 | X | X | |

NAND Gates

| Description | Type of Output | No. | LS | ALS | FAST |
|----------------------------|----------------|-----|----|-----|------|
| Quad 2-Input | 2S | 00 | X | X | X |
| | OC | 01 | X | X | |
| | OC | 03 | X | X | |
| Quad 2-Input, High Voltage | OC | 28 | X | | |
| | | | | | |
| Triple 3-Input | 2S | 10 | X | X | X |
| | OC | 12 | X | X | |
| Dual 4-Input | 2S | 20 | X | X | X |
| | OC | 22 | X | X | |
| 8-Input | 2S | 30 | X | | |
| 13-Input | 2S | 133 | X | | |

OR

| Description | Type of Output | No. | LS | ALS | FAST |
|--------------|----------------|-----|----|-----|------|
| Quad 2-Input | 2S | 32 | X | P | X |

NOR

| Description | Type of Output | No. | LS | ALS | FAST |
|----------------|----------------|-----|----|-----|------|
| Quad 2-Input | 2S | 2 | X | X | X |
| Triple 3-Input | 2S | 27 | X | X | |
| Dual 5-Input | 2S | 260 | X | | |

Exclusive OR

| Description | Type of Output | No. | LS | ALS | FAST |
|--------------|----------------|-----|----|-----|------|
| Quad 2-Input | 2S | 86 | X | | P |
| | OC | 136 | X | | |
| | 2S | 386 | X | | |

Exclusive NOR

| Description | Type of Output | No. | LS | ALS | FAST |
|--------------|----------------|-----|----|-----|------|
| Quad 2-Input | OC | 266 | X | | |

AND-OR-INVERT Gates

| Description | Type of Output | No. | LS | ALS | FAST |
|------------------------------|----------------|-----|----|-----|------|
| Dual 2-Wide, 2-Input/3-Input | 2S | 51 | X | X | |
| 4-Wide, 2-3-2-3-Input | 2S | 54 | X | | |
| 2-Wide, 4-Input | 2S | 55 | X | X | |
| 4-Wide, 4-2-2-3-Input | 2S | 64 | | | X |

Schmitt Triggers

| Description | Type of Output | No. | LS | ALS | FAST |
|------------------------|----------------|-----|----|-----|------|
| Dual 4-Input NAND Gate | 2S | 13 | X | P | |
| Hex, Inverting | 2S | 14 | X | P | |
| Quad 2-Input NAND Gate | 2S | 132 | X | P | |

SSI Flip-Flops

| Description | Clock Edge | No. | LS | ALS | FAST |
|-----------------------|------------|-----|----|-----|------|
| Dual D w/Set & Clear | Pos | 74 | X | X | X |
| Dual JK w/Set | Neg | 113 | X | | P |
| Dual JK w/Clear | Neg | 73 | X | | |
| | Neg | 107 | X | | |
| Dual JK w/Set & Clear | Neg | 76 | X | | |
| | Neg | 78 | X | | |
| | Neg | 112 | X | | P |
| | Neg | 114 | X | | P |
| Dual JK w/Set & Clear | Pos | 109 | X | P | X |

Multiplexers

| Description | Type of Output | No. | LS | ALS | FAST |
|----------------------------------|----------------|-----|----|-----|------|
| Quad 2-to-1, Non-Inverting | 2S | 157 | X | X | P |
| | 3S | 257 | X | P | P |
| Quad 2-to-1, Inverting | 2S | 158 | X | X | P |
| | 3S | 258 | X | P | P |
| Dual 4-to-1, Non-Inverting | 2S | 153 | X | P | X |
| | 3S | 253 | X | P | X |
| Dual 4-to-1, Inverting | 2S | 352 | X | P | X |
| | 3S | 353 | X | P | X |
| 8-to-1 | 2S | 151 | X | P | P |
| | 3S | 251 | X | P | P |
| Quad 2-to-1 with Output Register | 2S | 298 | X | | |
| | 2S | 398 | X | | |
| | 2S | 399 | X | | |

Encoders

| Description | Type of Output | No. | LS | ALS | FAST |
|-------------------------------|----------------|-----|----|-----|------|
| 10- to 4-Line BCD | 2S | 147 | X | | |
| 8- to 3-Line Priority Encoder | 2S | 148 | X | | |
| | 3S | 348 | X | | |
| | 2S | 748 | X | | |
| | 3S | 848 | X | | |

Register Files

| Description | Type of Output | No. | LS | ALS | FAST |
|-------------|----------------|-----|----|-----|------|
| 4 x 4 | OC | 170 | X | | |
| | 3S | 670 | X | | |

Shift Registers

| Description | No. of Bits | Type of Output | Mode* | | | | No. | LS | ALS | FAST |
|--|-------------|----------------|-------|----|------|-------|-----|----|-----|------|
| | | | SR | SL | Hold | Reset | | | | |
| Serial In-Serial Out | 8 | 2S | X | | | | 91 | X | P | |
| Serial In-Parallel Out | 8 | 2S | X | | | A | 164 | X | P | |
| Parallel In-Serial Out | 8 | 2S | X | | X | A | 165 | X | | |
| | 8 | 2S | X | | X | A | 166 | X | | |
| | 16 | 3S | X | | X | | 674 | X | | |
| Parallel In-Parallel Out | 4 | 2S | X | | | | 95 | X | | |
| | 4 | 2S | X | X | X | A | 194 | X | | P |
| | 4 | 2S | X | | | A | 195 | X | | P |
| | 4 | 3S | X | | | | 295 | X | | |
| | 4 | 3S | X | | | A | 395 | X | | |
| Parallel In-Parallel Out, Bidirectional | 8 | 3S | X | X | X | A | 299 | X | | |
| | 8 | 3S | X | X | X | S | 323 | X | | P |
| Sign Extended Bidirectional | 8 | 3S | X | | X | A | 322 | X | | |
| Serial In-Parallel Out with Storage Register | 16 | 2S/3S | X | | X | S | 673 | X | | |
| Parallel In-Parallel Out with Storage Register/Mux | 4 | 3S | X | X | X | A | 671 | | P | |
| | 4 | 3S | X | X | X | S | 672 | | P | |

* SR = Shift Right
SL = Shift Left

Decoders/Demultiplexers

| Description | Type of Output | No. | LS | ALS | FAST |
|-------------------|----------------|-----|----|-----|------|
| Dual 1-of-4 | 2S | 139 | X | P | P |
| | 2S | 155 | X | | |
| | OC | 156 | X | | |
| | 2S | 239 | | P | |
| 1-of-8 | 3S | 539 | | P | P |
| | 2S | 138 | X | P | P |
| | 2S | 238 | | P | |
| | 3S | 538 | | P | P |
| 1-of-8 with Latch | 2S | 137 | X | | |
| 1-of-10 | 2S | 42 | X | | |
| | 3S | 537 | | P | P |

Latches

| Description | No. of Bits | Type of Output | No. | LS | ALS | FAST |
|---------------------------------------|-------------|----------------|-----|----|-----|------|
| Transparent, Non-Inverting | 4 | 2S | 77 | X | | |
| | 8 | 3S | 373 | X | P | P |
| | 8 | 3S | 573 | | P | |
| Transparent, Inverting | 8 | 3S | 533 | | P | X |
| | 8 | 3S | 563 | | P | |
| | 8 | 3S | 580 | | P | |
| | 8 | 3S | 580 | | P | |
| Transparent, Q and \bar{Q} Outputs | 4 | 2S | 75 | X | | |
| | 4 | 2S | 375 | X | | |
| Quad Set-Reset Latch | 4 | 2S | 279 | X | | |
| Addressable | 8 | 2S | 259 | X | | |
| Dual 4-Bit Addressable | 4 | 2S | 256 | X | | |
| Dual 4-Bit Transparent, Non-Inverting | 8 | 3S | 873 | | P | |
| Dual 4-Bit Transparent, Inverting | 8 | 3S | 880 | | P | |

Asynchronous Counters — Negative Edge-Triggered*

| Description | Load | Set | Reset | No. | LS | ALS | FAST |
|--------------------|------|-----|-------|------|----|-----|------|
| Decade (2/5) | X | X | X | 90 | X | | |
| | | X | X | 196 | X | | |
| | | X | X | 290 | X | | |
| Dual Decade (2/5) | | | X | 390 | X | | |
| Dual Decade | | X | X | 490 | X | | |
| Modulo 12 (2/6) | | | X | 92 | X | | |
| 4-Bit Binary (2/8) | X | | X | 93 | X | | |
| | | | X | 197 | X | | |
| | | | X | 293 | X | | |
| Dual 4-Bit Binary | | | X | 393 | X | | |
| Divide-By-N (0-9) | X | | X | 716* | X | | |
| Divide-By-N (0-15) | X | | X | 718* | X | | |

*The 716 and 718 are positive edge-triggered.

Display Decoders/Drivers with Open-Collector Outputs*

| Description | No. | LS | ALS | FAST |
|------------------|------|----|-----|------|
| 1-of-10 | 145 | X | | |
| BCD-to-7 Segment | 47 | X | | |
| | 48* | X | | |
| | 49 | X | | |
| | 247 | X | | |
| | 248* | X | | |
| | 249 | X | | |

*The 48 and 248 have internal pullup resistors to V_{CC} on their outputs.

Cascadable* Synchronous Counters — Positive Edge-Triggered

| Description | Type of Output | Load | Reset | No. | LS | ALS | FAST |
|------------------------------|----------------|------|-------|-----|----|-----|------|
| Decade | 2S | S | A | 160 | X | X | P |
| | 2S | S | S | 162 | X | X | P |
| | 3S | B | B | 560 | | P | |
| Decade, Up/Down | 2S | S | | 168 | X | P | P |
| | 2S | A | | 190 | X | X | P |
| | 2S | A | A | 192 | X | X | P |
| | 3S | S | B | 568 | X | P | |
| | 2S | S | | 668 | X | | |
| 4-Bit Binary | 2S | S | A | 161 | X | X | P |
| | 2S | S | S | 163 | X | X | P |
| | 3S | B | B | 561 | | P | |
| 4-Bit Binary, Up/Down | 2S | S | | 169 | X | P | P |
| | 2S | A | | 191 | X | X | P |
| | 2S | A | A | 193 | X | X | P |
| | 3S | S | B | 569 | X | P | |
| | 2S | S | | 669 | X | | |
| Decade with Latch/Mux | 3S | S | A | 690 | | P | |
| | 3S | S | S | 692 | | P | |
| | 3S | S | S | 694 | | P | |
| Decade with Register/Mux | 3S | S | A | 696 | | P | |
| | 3S | S | S | 698 | | P | |
| 4-Bit Binary w/ Latch/Mux | 3S | S | A | 691 | | P | |
| | 3S | S | S | 693 | | P | |
| | 3S | S | S | 695 | | P | |
| 4-Bit Binary w/ Register/Mux | 3S | S | A | 697 | | P | |
| | 3S | S | S | 699 | | P | |

*The 192 and 193 do not provide a clock enable for synchronous cascading.

MSI Flip-Flops/Registers

| Description | No. of Bits | Type of Output | Set or Reset | Clock Enable | No. | LS | ALS | FAST |
|---------------------------------|-------------|----------------|--------------|--------------|-----|----|-----|------|
| D-Type, Non-Inverting | 4 | 3S | A | X | 173 | X | | |
| | 4 | 2S | | X | 377 | X | X | |
| | 6 | 2S | A | | 174 | X | | P |
| | 6 | 2S | | X | 378 | X | | P |
| | 8 | 2S | A | | 273 | X | X | |
| | 8 | 3S | | | 374 | X | | X |
| | 8 | 3S | | | 574 | | P | |
| | 8 | 3S | S | | 575 | | P | |
| D-Type, Inverting | 8 | 3S | | | 534 | | P | X |
| | 8 | 3S | | | 584 | | P | |
| | 8 | 3S | | | 576 | | P | |
| | 8 | 3S | S | | 577 | | P | |
| D-Type, Q and \bar{Q} Outputs | 4 | 2S | A | | 175 | X | | P |
| | 4 | 2S | | X | 379 | X | | P |
| Dual 4-Bit, Non-Inverting | 8 | 3S | A | | 874 | | P | |
| | 8 | 3S | S | | 878 | | P | |
| Dual 4-Bit, Inverting | 8 | 3S | A | | 876 | | P | |
| | 8 | 3S | S | | 879 | | P | |
| Dual 8-Bit with Multiplexers | 16 | 3S | | | 604 | X | | |
| | 16 | OC | | | 605 | X | | |
| | 16 | 3S | | | 606 | X | | |
| | 16 | OC | | | 607 | X | | |

Arithmetic Operators

| Description | No. | LS | ALS | FAST |
|-----------------------------|-----|----|-----|------|
| 4-Bit Adder | 83 | X | | |
| | 283 | X | | P |
| 4-Bit ALU | 181 | X | | P |
| | 381 | | | P |
| | 382 | | | P |
| Look Ahead Carry Generator | 182 | X | | P |
| Quad 4-Bit Adder/Subtractor | 385 | X | | |
| Dual Carry/Save Full Adder | 183 | X | | |
| 4-Bit Barrel Shifter | 350 | | | P |

Magnitude Comparitors

| Description | Type of Output | P=Q | P>Q | P<Q | No. | LS | ALS | FAST |
|--------------------------|----------------|-----|-----|-----|-----|----|-----|------|
| 4-Bit | 2S | X | X | X | 85 | X | | |
| 8-Bit | 2S | X | X | | 682 | X | | |
| | OC | X | X | | 683 | X | | |
| | 2S | X | X | | 684 | X | | |
| | OC | X | X | | 685 | X | | |
| | 2S | X | | | 521 | | | P |
| 8-Bit with Output Enable | 2S | X | X | | 686 | X | | |
| | OC | X | X | | 687 | X | | |
| | 2S | X | | | 688 | X | | |
| | OC | X | | | 689 | X | | |

Parity Generators/Checkers

| Description | No. | LS | ALS | FAST |
|---|-----|----|-----|------|
| 9-Bit Odd/Even Parity Generator/Checker | 280 | X | | P |

Dynamic Memory Support

| Description | No. | LS | ALS | Fast |
|---|------|----|-----|------|
| Synchronous Address Multiplexer (MC6883) | 783 | X | | |
| Error Detection and Correction Circuit (EDAC) | 2960 | | | P |
| EDAC Bus Buffer | 2961 | | | P |
| | 2962 | | | P |
| Dynamic Memory Controller | 2968 | | | P |
| Dynamic Memory Timing Controller with EDAC | 2969 | | | P |
| Dynamic Memory Timing Controller without EDAC | 2970 | | | P |

VCOs and Multivibrators

| Description | No. | LS | ALS | FAST |
|--|-----|----|-----|------|
| Retriggerable Monostable Multivibrator | 122 | X | | |
| Dual 122 | 123 | X | | |
| Precision Non-Retriggerable Monostable Multivibrator | 221 | X | | |
| Voltage/Crystal Controlled Oscillator | 724 | X | | |

Buffers/Line Drivers

| Description | Type of Output | No. | LS | ALS | FAST |
|----------------------|----------------|-----|----|-----|------|
| Quad 2-Input NOR | 2S | 28 | X | P | |
| | OC | 33 | X | P | |
| Quad 2-Input NAND | 2S | 37 | X | X | |
| | OC | 38 | X | X | |
| Dual 4-Input NAND | 2S | 40 | X | P | |
| Quad, Non-Inverting | 3S | 125 | X | | |
| | 3S | 126 | X | | |
| Hex, Non-Inverting | 3S | 365 | X | | |
| | 3S | 367 | X | | |
| Hex, Inverting | 3S | 366 | X | | |
| | 3S | 368 | X | | |
| Octal, Non-Inverting | 3S | 241 | X | X | P |
| | 3S | 244 | X | X | P |
| | 3S | 541 | X | P | |
| | 3S | 795 | X | | |
| | 3S | 797 | X | | |
| Octal, Inverting | 3S | 240 | X | X | P |
| | 3S | 540 | X | P | |
| | 3S | 796 | X | | |
| | 3S | 798 | X | | |

Transceivers

| Description | Type of Output | No. | LS | ALS | FAST |
|--|----------------|-----|----|-----|------|
| Quad, Non-Inverting | 3S | 243 | X | X | P |
| Quad, Inverting | 3S | 242 | X | X | P |
| Octal, Non-Inverting | 3S | 245 | X | X | X |
| | 3S | 645 | X | | |
| | OC | 621 | X | X | |
| | 3S | 623 | X | X | X |
| | 3S/OC | 639 | | X | |
| | OC | 641 | X | X | |
| Octal, Inverting | 3S | 620 | X | X | X |
| | OC | 622 | X | X | |
| | 3S/OC | 638 | | X | |
| | 3S | 640 | X | X | X |
| | OC | 642 | X | X | |
| | 3S | 643 | X | X | X |
| | OC | 644 | X | X | |
| Octal, Non-Inverting with Register/Mux | 3S | 646 | | P | |
| | OC | 647 | | P | |
| | 3S | 652 | | P | |
| | OC/3S | 654 | | P | |
| Octal, Inverting with Register/Mux | 3S | 648 | | P | |
| | OC | 649 | | P | |
| | 3S | 651 | | P | |
| | OC/3S | 653 | | P | |

RAM

| Description | Type of Output | No. | LS | ALS | FAST |
|-------------|----------------|-----|----|-----|------|
| 16-by-4 | 3S | 189 | | | P |
| | OC | 289 | | | P |

Circuit Characteristics

SCHOTTKY TTL



FAMILY CHARACTERISTICS

LS TTL

The Low Power Schottky (LSTTL) family combines a current and power reduction improvement over standard 7400 TTL by a factor of 5. This is accomplished by using Schottky diode clamping to prevent saturation and advanced processing.

ALS TTL

The Advanced Low Power Schottky TTL family (ALS TTL) provides a 50% power reduction compared to standard 54/74 LS TTL and yet offers improved circuit performance over standard LS due to Motorola's state-of-the-art oxide isolated process (MOSAIC). ALS also differs from LS in that PNP transistors on the input stage are utilized to lower input currents and raise thresholds.

FAST TTL

The FAST Schottky TTL family provides a 75-80% power reduction compared to standard Schottky (54/74S) TTL and yet offers a 20-40% improvement in circuit performance over the standard Schottky due to the MOSAIC process. Also, FAST circuits contain additional circuitry to provide a flatter power/frequency curve. The input configuration of FAST uses a lower input current which translates into higher fanout.

CIRCUIT FEATURES

Circuit features of LS, ALS and FAST are best understood by examining the TTL 2-input NAND gate of each family (Figures 2-1-a,b,c). The input/output circuits of other functions are almost identical.

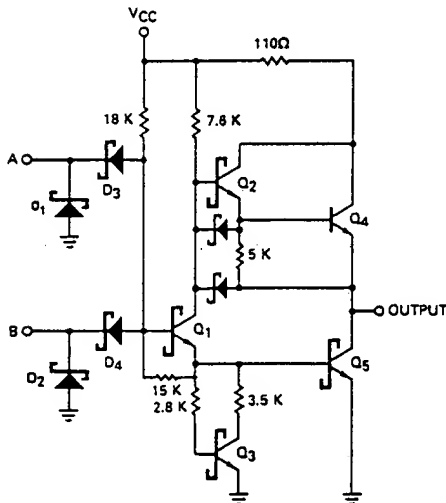


FIGURE 2-1a
LS00 — 2-INPUT NAND GATE

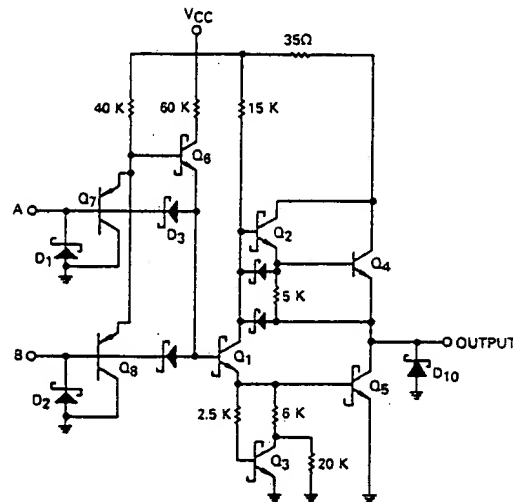


FIGURE 2-1b
ALS00 — 2-INPUT NAND GATE

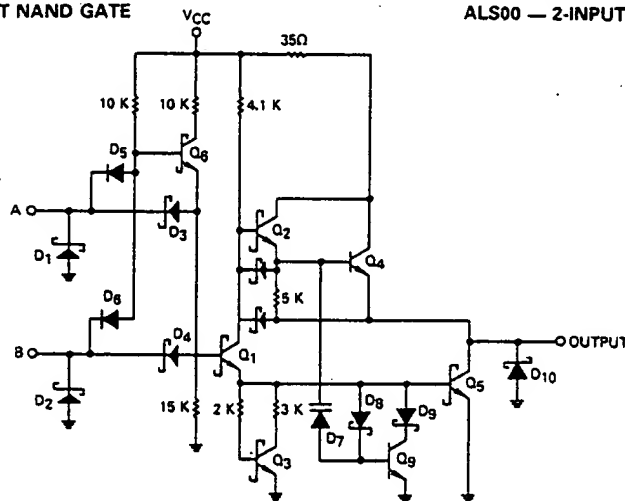


FIGURE 2-1c
F00 — 2-INPUT NAND GATE

INPUT CONFIGURATION — LS TTL circuits do not use the multi-emitter structure that originally gave TTL its name. Most LS elements use a DTL type input circuit with Schottky diodes to perform the AND function, as exemplified by D3 and D4 in Figure 2-1a. Compared to the classical multi-emitter structure, this circuit is faster and increases the input breakdown voltage. Inputs of this type are tested for leakage with an applied input voltage of 7.0 V and the input breakdown voltage is typically 15 V or more.

The ALS00 differs from the LS00 in that Q6, Q7 and Q8 have been added to reduce input current (I_{IL}) by a factor of 4, and increase input threshold from approximately 1.1 to 1.5 volts.

The F00 input configuration utilizes a PN diode (D5 and D6) rather than the PNP transistor used in ALS. This is required due to the high speed response of FAST™ logic. The PNP transistor, a relatively large device in current bipolar logic technology, has an associated capacitance large enough to make the gate input susceptible to ac noise. The PN diode results in much better ac noise immunity at the expense of increased input current.

Another input arrangement often used in LS MSI has three diodes connected as shown in Figure 2-2. This configuration gives a slightly higher input threshold than that of Figure 2-1a. A third input configuration that is sometimes used in LS TTL employs a vertical PNP transistor as shown in Figure 2-3. As with the ALS input, this arrangement also gives a higher input threshold and has the additional advantage of reducing the amount of current that the signal source must sink. Both the diode cluster arrangement and the PNP input configuration have breakdown voltage ratings greater than 7.0 V.

All inputs are provided with clamping diodes, exemplified by D1 and D2 in Figure 2-1a,b,c. These diodes conduct when an input signal goes negative, which limits undershoot and helps to control ringing on long signal lines following a HIGH-to-LOW transition. These diodes are intended only for the suppression of transient currents and should not be used as steady-state clamps in interface applications. A clamp current exceeding 2 mA and with a duration greater than 500 ns can activate a parasitic lateral NPN transistor, which in turn can steal current from internal nodes of an LS circuit and thus cause logic errors.

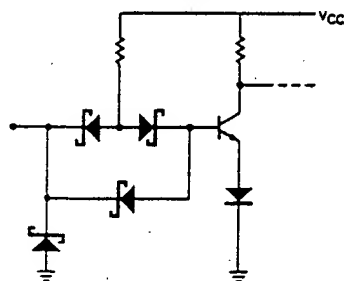


FIGURE 2-2
DIODE CLUSTER INPUT

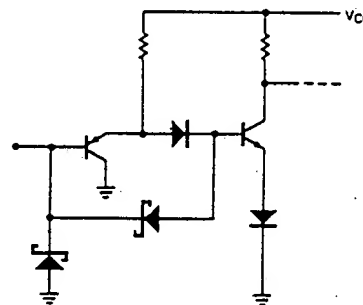


FIGURE 2-3
PNP INPUT

INPUT CHARACTERISTICS — Figure 2-4 shows the typical input characteristics of LS, ALS, and FAST™. Typical transfer characteristics can be found in Figure 2-5 and input threshold variation with temperature information is provided in Table 2-1.

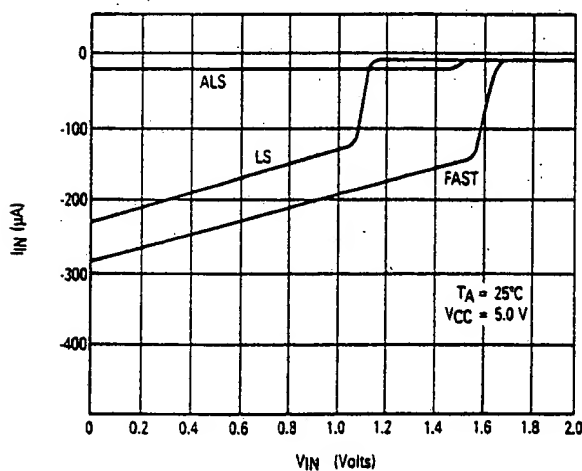


FIGURE 2-4
TYPICAL INPUT CURRENT VS. INPUT VOLTAGE

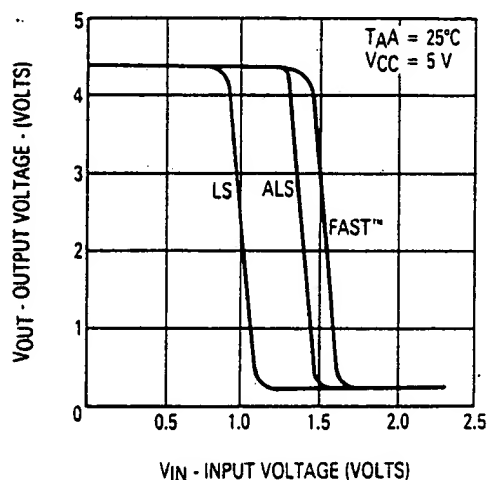


FIGURE 2-5
TYPICAL OUTPUT vs
INPUT VOLTAGE CHARACTERISTIC

| | -55°C | +25°C | +125°C |
|------|-------|-------|--------|
| FAST | 1.8 | 1.5 | 1.3 |
| ALS | 1.8 | 1.5 | 1.3 |
| S | 1.5 | 1.3 | 1.1 |
| LS | 1.2 | 1.0 | 0.8 |

TABLE 2.1
TYPICAL INPUT THRESHOLD VARIATION
WITH TEMPERATURE

OUTPUT CONFIGURATION. The output circuitry of LSTTL has several features not found in conventional TTL. A few of these features are discussed below.

Referring to Figures 2-1a,b,c, the base of the pull-down output transistor Q5 is returned to ground through Q3 and a pair of resistors instead of through a simple resistor. This arrangement is called a squaring network since it squares up the transfer characteristics (Figure 2-5) by preventing conduction in the phase splitter Q1 until the input voltage rises high enough to allow Q1 to supply base current to Q5. The squaring network also improves the propagation delay by providing a low resistance path to discharge capacitance at the base of Q5 during turn-off.

The output pull-up circuit is a 2-transistor Darlington circuit with the base of the output transistor returned through a 5k resistor to the output terminals, unlike 74H and 74S where it is returned to ground which is a more power consuming configuration. This configuration allows the output to pull up to one V_{BE} below V_{CC} for low values of output current.

The ALS00 and F00 outputs include clamping diodes to limit undershoot and control ringing on long signal lines. As with the input diode clamps, these diodes are intended for transient suppression only and should not be used as steady state clamps.

The F00 output configuration also includes additional circuitry to improve the rise time and decrease the power consumption at high operating frequencies. This circuit, which consists of Q9, D7, D8, and D9 causes Q5 to off more quickly on LOW to HIGH output transitions.

Figure 2-6 shows the extra circuitry used to obtain the "high Z" condition in 3-state outputs. When the Output Enable signal is HIGH, both the phase splitter and the Darlington pull-up are turned off. In this condition the output circuitry is non-conducting, which allows the outputs of two or more such circuits to be connected together in a bus application wherein only one output is enabled at any particular time.

FAST™ 3-state outputs have some additional circuitry due to the nature of the environment in which they are used. The effective capacitive load of a 3-state output tends to increase at high bus rates. The addition of Q10 reduces this effect by clamping the base of Q5 low when the device is in the high impedance state. In the high Z state, the output capacitance is about 5 pF for 24 mA outputs and about 12 pF for 64 mA outputs.

An additional feature of many FAST™ 3-state devices is the incorporation of power-up circuitry to guarantee that the output will not sink current if the device is disabled during the application or removal of power.

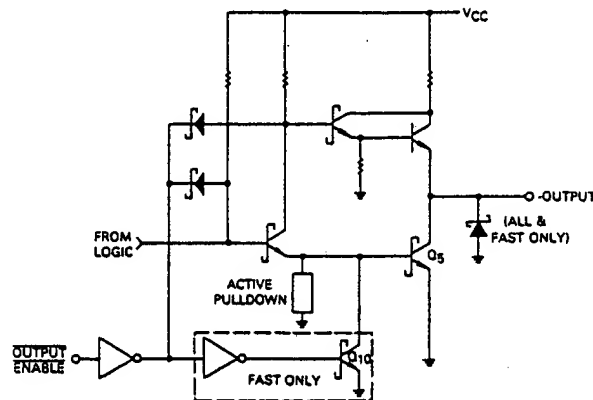


FIGURE 2-6
TYPICAL 3-STATE OUTPUT CONTROL

OUTPUT CHARACTERISTICS. Figure 2-7 shows the LOW-state output characteristics for LS, ALS and FAST™. For LOW I_{OL} values, the pull-down transistor is clamped out of deep saturation to shorten the turn-off delay. Figure 2-8 shows the HIGH-state output characteristics.

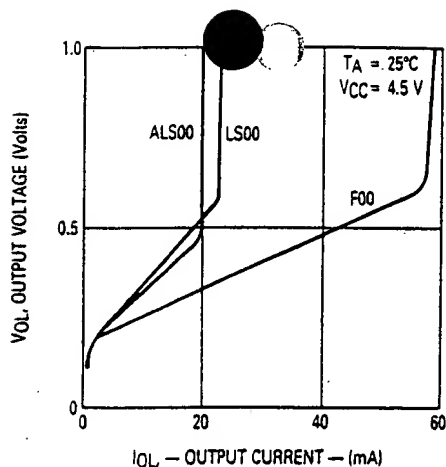


FIGURE 2-7a — OUTPUT LOW CHARACTERISTIC

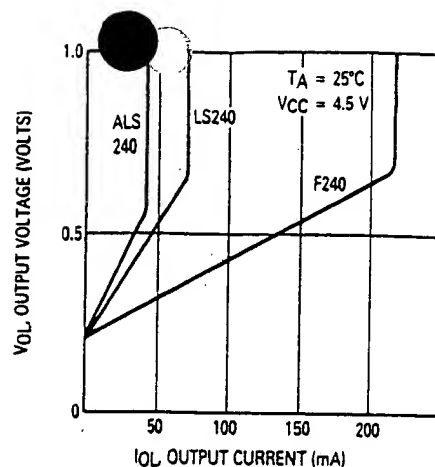


FIGURE 2-7b — OUTPUT LOW CHARACTERISTIC

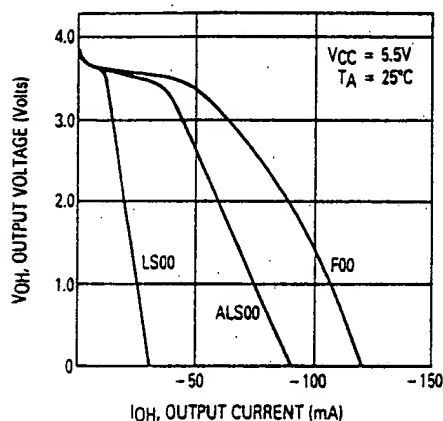


FIGURE 2-8a — OUTPUT HIGH CHARACTERISTIC

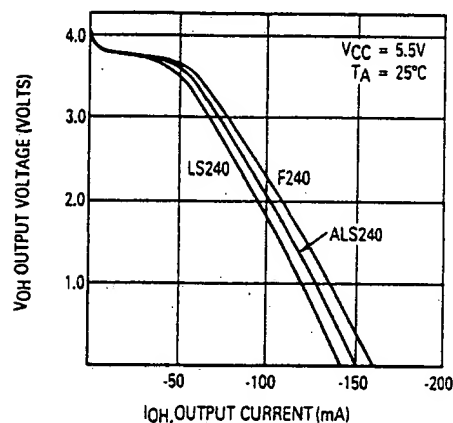


FIGURE 2-8b — OUTPUT HIGH CHARACTERISTIC

AC SWITCHING CHARACTERISTICS. The propagation through a logic element depends on power supply voltage, ambient temperature, and output load. The effect of each of these parameters on ac propagation is shown in Figures 2-9 through 2-11.

The delay through a logic element will increase to some extent when multiple outputs switch simultaneously due to inductance internal to the IC package. This effect can be seen by comparing Figures 2-11e and 2-11f.

For LS TTL, limits are guaranteed at 25°C, $V_{CC} = 5.0$ V, and $C_L = 15$ pF (normally, resistive load has minimal effect on propagation delay). ALS and FAST™ TTL limits are guaranteed over the commercial or military temperature and supply voltage ranges and with $C_L = 50$ pF.

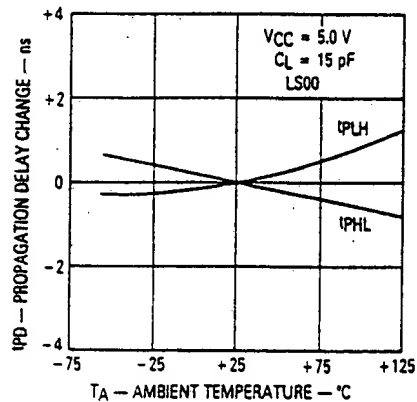


FIGURE 2-9

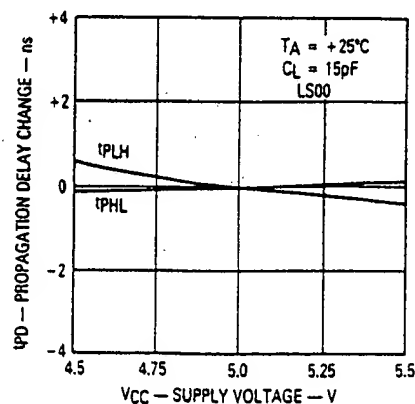


FIGURE 2-10

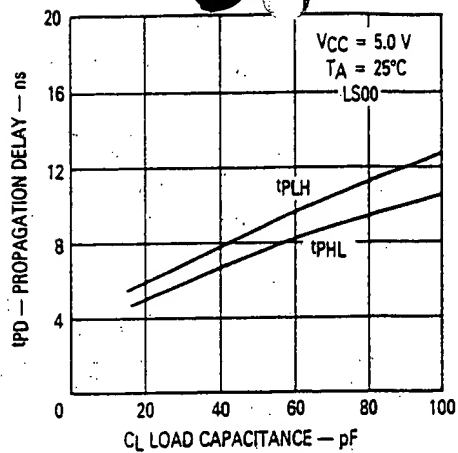


FIGURE 2-11a*

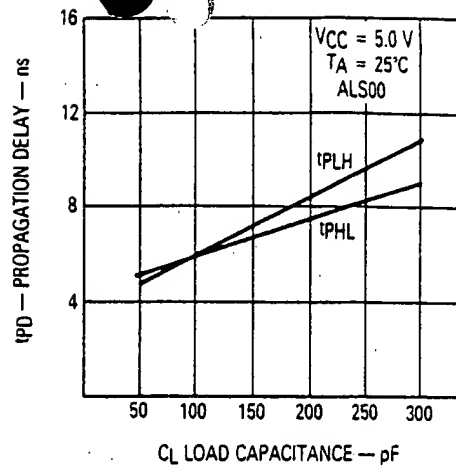


FIGURE 2-11b*

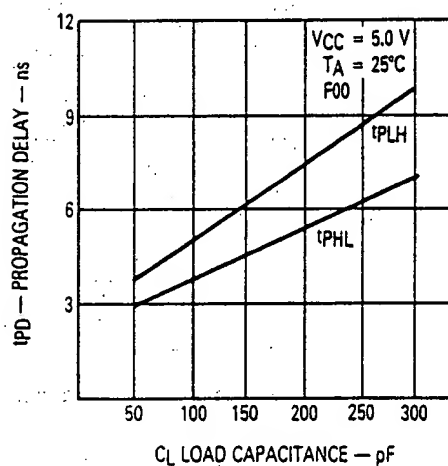


FIGURE 2-11c*

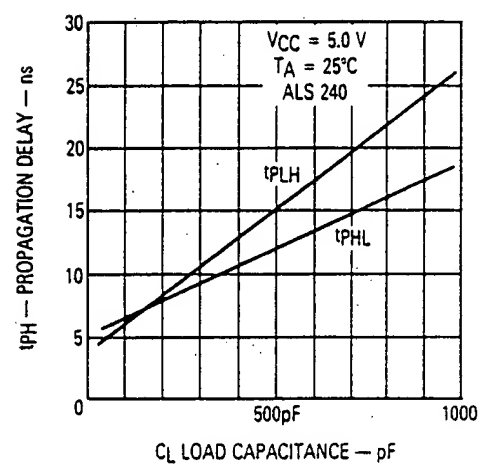


FIGURE 2-11d*

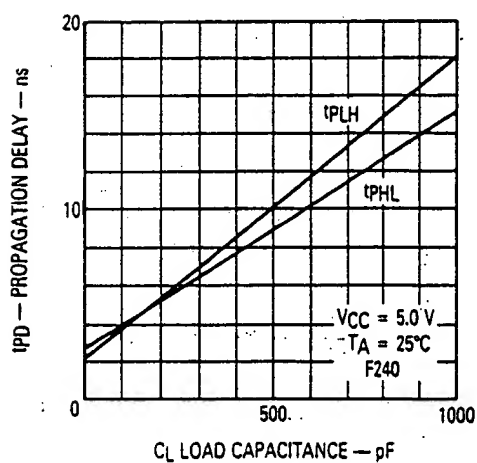


FIGURE 2-11e*

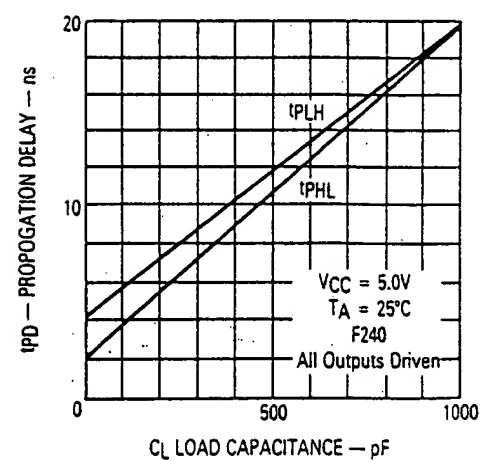


FIGURE 2-11f

*Data for Figures 2-11a through 2-11e was taken with only one output switching at a time. Figure 2-11f data was taken with all 8 inputs of the F240 tied together.

Design Considerations Symbol Definitions and Testing

SCHOTTKY TTL



SELECTING TTL LOGIC. TTL Families may be mixed in a system for optimum performance. For instance, in new designs, ALS would commonly be used in non-critical speed paths to minimize power consumption while FAST™ TTL would be used in high speed paths. The ratio of ALS to FAST™ will depend on overall system design goals.

NOISE IMMUNITY. When mixing TTL families it is often desirable to know the guaranteed noise immunity for both LOW and HIGH logic levels. Table 3.1 lists the guaranteed logic levels for various TTL families and can be used to calculate noise margin. Table 3.2 specifies these noise margins for systems containing LS, S, ALS and/or FAST™ TTL. Note that Table 3.2 represents "worst case" limits and assumes a maximum power supply and temperature variation across the IC's which are interconnected, as well as maximum rated load. Increased noise immunity can be achieved by designing with decreased maximum allowable operating ranges.

TABLE 3.1
Worst Case TTL Logic Levels

Electrical Characteristics

| | TTL Families | Military (—55 to ±125°C) | | | | Commercial (0 to 70°C) | | | | UNITS |
|-------------------------------|----------------------------------|--------------------------|-----------------|-----------------|-----------------|------------------------|-----------------|-----------------|-----------------|-------|
| | | V _{IL} | V _{IH} | V _{OL} | V _{OH} | V _{IL} | V _{IH} | V _{OL} | V _{OH} | |
| TTL | Standard TTL 9000, 54/74 | 0.8 | 2.0 | 0.4 | 2.4 | 0.8 | 2.0 | 0.4 | 2.4 | V |
| HSTTL | High Speed TTL 54H/74H | 0.8 | 2.0 | 0.4 | 2.4 | 0.8 | 2.0 | 0.4 | 2.4 | V |
| LPSTTL | Low Power TTL 93L00 (MSI) | 0.7 | 2.0 | 0.3 | 2.4 | 0.8 | 2.0 | 0.3 | 2.4 | V |
| STTL | Schottky TTL 54S/74S, 93S00 | 0.8 | 2.0 | 0.5 | 2.5 | 0.8 | 2.0 | 0.5 | 2.7 | V |
| LSTTL | Low Power Schottky TTL 54LS/74LS | 0.7 | 2.0 | 0.4 | 2.5 | 0.8 | 2.0 | 0.5 | 2.7 | V |
| ALS TTL (5% V _{CC}) | Advanced LS TTL, 54ALS/74ALS | | | | | 0.8 | 2.0 | 0.5 | 2.75 | V |
| (10% V _{CC}) | | 0.8 | 2.0 | 0.4 | 2.5 | 0.8 | 2.0 | 0.5 | 2.5 | V |
| FAST TTL(5% V _{CC}) | Advanced S TTL, 54F/74F | | | | | 0.8 | 2.0 | 0.5 | 2.7 | V |
| (10% V _{CC}) | | 0.8 | 2.0 | 0.5 | 2.5 | 0.8 | 2.0 | 0.5 | 2.5 | V |

V_{OL} and V_{OH} are the voltages generated at the output V_{IL} and V_{IH} are the voltage required at the input to generate the appropriate levels. The numbers given above are guaranteed worst-case values.

TABLE 3.2a
LOW Level Noise Margins (Military)

| From | To | LS | S | ALS | FAST | Units |
|-------|----|-----|-----|-----|------|-------|
| LS | | 300 | 400 | 400 | 400 | mV |
| S | | 200 | 300 | 300 | 300 | mV |
| ALS | | 300 | 400 | 400 | 400 | mV |
| FAST™ | | 200 | 300 | 300 | 300 | mV |

From "V_{OL}" to "V_{IL}"

TABLE 3.2b
HIGH Level Noise Margins (Military)

| From | To | LS | S | ALS | FAST | Units |
|-------|----|-----|-----|-----|------|-------|
| LS | | 500 | 500 | 500 | 500 | mV |
| S | | 500 | 500 | 500 | 500 | mV |
| ALS | | 500 | 500 | 500 | 500 | mV |
| FAST™ | | 500 | 500 | 500 | 500 | mV |

From "V_{OH}" to "V_{IH}"

TABLE 3.2c
LOW Level Noise Margins (Commercial)

| From | To | LS | S | ALS | FAST | Units |
|-------|----|-----|-----|-----|------|-------|
| LS | | 300 | 300 | 300 | 300 | mV |
| S | | 300 | 300 | 300 | 300 | mV |
| ALS | | 300 | 300 | 300 | 300 | mV |
| FAST™ | | 300 | 300 | 300 | 300 | mV |

From "V_{OL}" to "V_{IL}"

TABLE 3.2d
HIGH Level Noise Margins (Commercial)

| From | To | LS | S | ALS | FAST | Units |
|-----------------------------|----|-----|-----|-----|------|-------|
| LS | | 700 | 700 | 700 | 700 | mV |
| S | | 700 | 700 | 700 | 700 | mV |
| ALS (5% V _{CC}) | | 750 | 750 | 750 | 750 | mV |
| FAST (5% V _{CC}) | | 700 | 700 | 700 | 700 | mV |
| ALS (10% V _{CC}) | | 500 | 500 | 500 | 500 | mV |
| FAST (10% V _{CC}) | | 500 | 500 | 500 | 500 | mV |

From "V_{OH}" to "V_{IH}"

POWER CONSUMPTION. With the exception of ECL, all logic families exhibit increased power consumption at high frequencies. Figure 3.1 shows this characteristic for common logic families. As indicated in the figure, TTL devices are more efficient at high frequencies than CMOS.

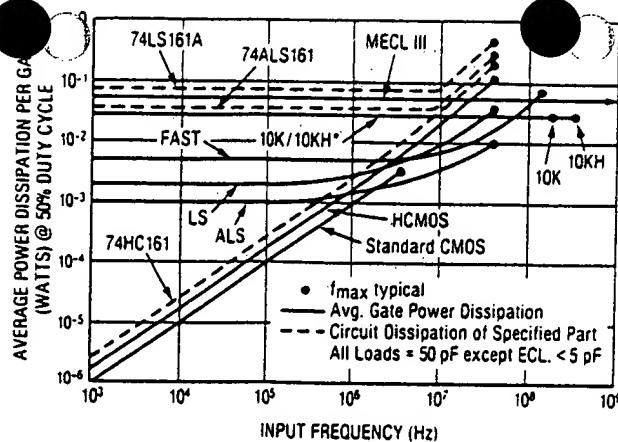


FIGURE 3-1
AVERAGE GATE POWER DISSIPATION
versus FREQUENCY

FAN-IN AND FAN-OUT. In order to simplify designing with Motorola TTL devices, the input and output loading parameters of all families are normalized to the following values:

- 1 TTL Unit Load (U.L.) = $40 \mu\text{A}$
in the HIGH state (Logic "1")
- 1 TTL Unit Load (U.L.) = 1.6 mA
in the LOW state (Logic "0")

Input loading and output drive factors of all products described in this handbook are related to these definitions.

EXAMPLES — INPUT LOAD

1. A 7400 gate, which has a maximum I_{IL} of 1.6 mA and I_{IH} of $40 \mu\text{A}$ is specified as having an input load factor of 1 U.L. (Also called a fan-in of 1 load.)
2. The 74LS95B which has a value of $I_{IL} = 0.8 \text{ mA}$ and I_{IH} of $40 \mu\text{A}$ on the CP terminal, is specified as having an input LOW load factor of

$$\frac{0.8 \text{ mA}}{1.6 \text{ mA}} \text{ or } 0.5 \text{ U.L.} \quad \text{and an input HIGH load factor of} \quad \frac{40 \mu\text{A}}{40 \mu\text{A}} \text{ or } 1 \text{ U.L.}$$

3. The 74LS00 gate which has an I_{IL} of 0.4 mA and an I_{IH} of $20 \mu\text{A}$, has an input LOW load factor of

$$\frac{0.4 \text{ mA}}{1.6 \text{ mA}} \text{ or } 0.25 \text{ U.L.} \quad \text{an input HIGH load factor of} \quad \frac{20 \mu\text{A}}{40 \mu\text{A}} \text{ or } 0.5 \text{ U.L.}$$

EXAMPLES — OUTPUT DRIVE

1. The output of the 7400 will sink 16 mA in the LOW (logic "0") state and source $800 \mu\text{A}$ in the HIGH (logic "1") state. The normalized output LOW drive factor is therefore

$$\frac{16 \text{ mA}}{1.6 \text{ mA}} = 10 \text{ U.L.}$$

and the output HIGH drive factor is

$$\frac{800 \mu\text{A}}{40 \mu\text{A}} \text{ or } 20 \text{ U.L.}$$

2. The output of the 74LS00 will sink 8.0 mA in the LOW state and source 400 μ A in the HIGH state. The normalized output LOW drive factor is

$$\frac{8.0 \text{ mA}}{1.6 \text{ mA}} \text{ or } 5 \text{ U.L.}$$

and the output HIGH drive factor is

$$\frac{400 \mu\text{A}}{40 \mu\text{A}} \text{ or } 10 \text{ U.L.}$$

Relative load and drive factors for the basic TTL families are given in Table 3.3.

| FAMILY | INPUT LOAD | | OUTPUT DRIVE | |
|---------|------------|-------------|--------------|-----------|
| | HIGH | LOW | HIGH | LOW |
| 74LS00 | 0.5 U.L. | 0.25 U.L. | 10 U.L. | 5 U.L. |
| 7400 | 1 U.L. | 1 U.L. | 20 U.L. | 10 U.L. |
| 9000 | 1 U.L. | 1 U.L. | 20 U.L. | 10 U.L. |
| 74H00 | 1.25 U.L. | 1.25 U.L. | 25 U.L. | 12.5 U.L. |
| 74S00 | 1.25 U.L. | 1.25 U.L. | 25 U.L. | 12.5 U.L. |
| 74 ALS | 0.5 U.L. | 0.0625 U.L. | 10 U.L. | 5 U.L. |
| 74 FAST | 0.5 U.L. | 0.375 U.L. | 25 U.L. | 12.5 U.L. |

TABLE 3.3

Values for MSI devices vary significantly from one element to another. Consult the appropriate data sheet for actual characteristics.

WIRED-OR APPLICATIONS. Certain TTL devices are provided with an "open" collector output to permit the Wired-OR (actually Wired-AND) function. This is achieved by connecting open collector outputs together and adding an external pull-up resistor.

The value of the pull-up resistor is determined by considering the fan-out of the OR tie and the number of devices in the OR tie. The pull-up resistor value is chosen from a range between maximum value (established to maintain the required V_{OH} with all the OR tied outputs HIGH) and a minimum value (established so that the OR tie fan-out is not exceeded when only one output is LOW).

MINIMUM AND MAXIMUM PULL-UP RESISTOR VALUES

$$R_{X(MIN)} = \frac{V_{CC(MAX)} - V_{OL}}{I_{OL} - N_2(LOW) \cdot 1.6 \text{ mA}}$$

$$R_{X(MAX)} = \frac{V_{CC(MIN)} - V_{OH}}{N_1 \cdot I_{OH} + N_2(HIGH) \cdot 40 \mu\text{A}}$$

where:

R_x = External Pull-up Resistor.
 N_1 = Number of Wired-OR Outputs
 N_2 = Number of Input Unit Loads (U.L.) being Driven
 $I_{OH} = I_{CEX}$ = Output HIGH Leakage Current
 I_{OL} = LOW Level Fan-out Current of Driving Element
 V_{OL} = Output LOW Voltage Level (0.5 V)
 V_{OH} = Output HIGH Voltage Level (2.4 V)
 V_{CC} = Power Supply Voltage

Example: Four 74LS03 gates driving four other LS gates or MSI inputs.

$$R_{X(MIN)} = \frac{5.25 \text{ V} - 0.5 \text{ V}}{8 \text{ mA} - 1.6 \text{ mA}} = \frac{4.75 \text{ V}}{6.4 \text{ mA}} = 742 \Omega$$

$$R_{X(MAX)} = \frac{4.75 \text{ V} - 2.4 \text{ V}}{4 \cdot 100 \mu\text{A} + 2 \cdot 40 \mu\text{A}} = \frac{2.35 \text{ V}}{0.48 \text{ mA}} = 4.9 \text{ k}\Omega$$

where:

| | |
|--------------|--|
| N_1 | = 4 |
| N_2 (HIGH) | = $4 \cdot 0.5 \text{ U.L.} = 2 \text{ U.L.}$ |
| N_2 (LOW) | = $4 \cdot 0.25 \text{ U.L.} = 1 \text{ U.L.}$ |
| I_{OH} | = $100 \mu\text{A}$ |
| I_{OL} | = 8 mA |
| V_{OL} | = 0.5 V |
| V_{OH} | = 2.4 V |

Any value of pull-up resistor between 742Ω and $4.9 \text{ k}\Omega$ can be used. The lower values yield the fastest speeds while the higher values yield the lowest power dissipation.

UNUSED INPUTS. For best noise immunity and switching speed, unused TTL inputs should not be left floating, but should be held between 2.4 V and the absolute maximum input voltage.

Two possible ways of handling unused inputs are:

1. Connect unused input to V_{CC} . LS, ALS and FAST™ TTL inputs have a breakdown voltage $> 7.0 \text{ V}$ and require, therefore, no series resistor.
2. Connect the unused input to the output of an unused gate that is forced HIGH.

CAUTION: Do not connect an unused LS, ALS or FAST™ input to another input of the same NAND or AND function. This method, recommended for normal TTL, increases the input coupling capacitance and thus reduces the ac noise immunity.

INPUT CAPACITANCE. As a rule of thumb, LS, ALS and FAST™ TTL inputs have an average capacitance of 5 pF for DIP packages. For an input that serves more than one internal function, each additional function adds approximately 1.5 pF .

LINE DRIVING — Because of its superior capacitive drive characteristics, TTL logic is often used in line driving applications which require various termination techniques to maintain signal integrity. Parameters associated with this application are listed in Table 3.4.

It is also often necessary to construct load lines to determine reflection waveforms in line driving applications. The input and output characteristic graphs of section 2 (Figs. 2-4, 2-7 and 2-8) can be very useful for this purpose.

OUTPUT RISE AND FALL TIMES provide important information in determining reflection waveforms and crosstalk coefficients. Typical rise and fall times are approximately 6.0 ns for ALS and LS and about 2.0 ns for FAST with a 50 pF load (measured 10-90%). Output rise and fall times become longer as capacitive load is increased.

INTERCONNECTION DELAYS. For those parts of a system in which timing is critical, designers should take into account the finite delay along the interconnections. These range from about 0.12 to 0.15 ns/inch for the type of interconnections normally used in TTL systems. Exceptions occur in systems using ground planes to reduce ground noise during a logic transition; ground planes give higher distributed capacitance and delays of about 0.15 to 0.22 ns/inch .

Most interconnections on a logic board are short enough that the wiring and load capacitance can be treated as a lumped capacitance for purposes of estimating their effect on the propagation delay of the driving circuit. When an interconnection is long enough that its delay is one-fourth to one-half of the signal transition time, the driver output waveform exhibits noticeable slope changes during a transition. This is evidence that during the initial portion of the output voltage transition the driver sees the characteristic impedance of the interconnection (normally 100Ω to 200Ω), which for transient conditions appears as a resistor returned to the quiescent voltage existing just before the beginning of the transition. This characteristic impedance forms a voltage divider with the driver output impedance, tending to produce a signal transition having the same rise or fall time as in the no-load condition but with a reduced amplitude. This attenuated signal travels to the far end of the interconnection, which is essentially an unterminated transmission line, where upon the signal starts doubling. Simultaneously, a reflection voltage is generated which has the same amplitude and polarity as the original signal, e.g., if the driver output signal is positive-going the reflection will be positive-going, and as it travels back toward the driver it adds to the line voltage. At the instant the reflection arrives at the driver it adds algebraically to the still-rising driver output, accelerating the transition rate and producing the noticeable change in slope.

(ALL MAXIMUM RATINGS)

| | | ALS | | | | | FAST | | Units |
|------------------------------------|-----------------|-------------|-------------|-------------|-------------|-------------|--------------|--------------|-----------------|
| Characteristic | Symbol | 54LSxxx | 74LSxxx | 54ALSxxx | 74ALSxxx | | 54Fxxx | 74Fxxx | |
| Operating Voltage Range | V _{CC} | 5 ± 10% | 5 ± 5% | 5 ± 10% | 5 ± 10% | 5 ± 5% | 5 ± 10% | 5 ± 5% | V _{dc} |
| Output Drive: Standard Output | I _{OH} | -0.4 | -0.4 | -0.4 | -0.4 | -0.4 | -1.0 | -1.0 | mA |
| | I _{OL} | 4.0 | 8.0 | 4.0 | 8.0 | 8.0 | 20 | 20 | mA |
| | I _{sc} | -20 to -100 | -20 to -100 | -25 to -150 | -25 to -150 | -25 to -150 | -60 to -150 | -60 to -150 | mA |
| Buffer Output | I _{OH} | -12 | -15 | -12 | -12 | -15 | -12 | -15 | mA |
| | I _{OL} | 12 | 24 | 12 | 12 | 24 | 48 | 64 | mA |
| | I _{SC} | -40 to -225 | -40 to -225 | -50 to -225 | -50 to -225 | -50 to -225 | -100 to -225 | -100 to -225 | mA |
| Buffer Line Driving Capability: | | | | | | | | | |
| Minimum R _L into 2.5 V | | 178 | 84 | 178 | 84 | 84 | 43 | 32 | Ω |
| Minimum R _L into 5.0 V | | 381 | 189 | 381 | 189 | 189 | 95 | 71 | Ω |

TABLE 3.4
OUTPUT CHARACTERISTICS FOR SCHOTTKY TTL LOGIC

If an interconnection is of such length that its delay is longer than half the signal transition time, the attenuated output of the driver has time to reach substantial completion before the reflection arrives. In the limit, the waveform observed at the driver output is a 2-step signal with a pedestal. In this circumstance the first load circuit to receive a full signal is the one at the far end, because of the doubling effect, while the last one to receive a full signal is the one nearest the driver since it must wait for the reflection to complete the transition. Thus, in a worst-case situation, the net contribution to the overall delay is twice the delay of the interconnection because the initial part of the signal must travel to the far end of the line and the reflection must return.

When load circuits are distributed along an interconnection, the input capacitance of each will cause a small reflection having a polarity opposite that of the signal transition, and each capacitance also slows the transition rate of the signal as it passes by. The series of small reflections, arriving back at the driver, is subtractive and has the effect of reducing the apparent amplitude of the signal. The successive slowing of the transition rate of the transmitted signal means that it takes longer for the signal to rise or fall to the threshold level of any particular load circuit. A rough but workable approach is to treat the load capacitances as an increase in the intrinsic distributed capacitance of the interconnection. Increasing the distributed capacitance of a transmission line reduces its impedance and increases its delay. A good approximation for ordinary TTL interconnections is that distributed load capacitance decreases the characteristic impedance by about one-third and increases the delay by one-half.

ABSOLUTE MAXIMUM RATINGS (above which the useful life may be impaired)

| | LS | ALS | FAST |
|--|-------------------|-------------------|-------------------|
| Storage Temperature | -65°C to +150°C | -65°C to +150°C | -65°C to +150°C |
| Temperature (Ambient) Under Bias | -55°C to +125°C | -55°C to +125°C | -55°C to +125°C |
| V _{CC} Pin Potential to Ground Pin | -0.5 V to +7.0 V | -0.5 V to +7.0 V | -0.5 V to +7.0 V |
| *Input Voltage (dc) Diode Inputs | -0.5 V to 15 V | -0.5 V to 5.5 V | -0.5 V to 5.5 V |
| *Input Current (dc) | -30 mA to +5.0 mA | -30 mA to +5.0 mA | -30 mA to +5.0 mA |
| Voltage Applied to Open Collector Outputs (Output HIGH) | -0.5 V to +10 V | -0.5 V to +5.5 V | -0.5 V to +5.5 V |
| High Level Voltage Applied to Disabled 3-State Output | 5.5 V | 5.5 V | 5.5 V |

*Either input voltage limit or input circuit limit is sufficient to protect the inputs — Circuits with 5.5 V maximum limits are listed below.

Device types having inputs limited to 5.5 V are as follows:

| | |
|--------------------------|--------------------------------|
| SN74LS242/243, SN74LS245 | — Inputs connected to outputs. |
| SN74LS640/641/642/645 | — Inputs connected to outputs. |
| SN74LS299/322A/323 | — Certain Inputs. |
| SN74LS673/674 | — Certain Inputs. |

DEFINITION OF SYMBOLS AND TERMS USED IN DATABOOK

CURRENTS — Positive current is defined as conventional current flow into a device. Negative current is defined as conventional current flow out of a device. All current limits are specified as absolute values.

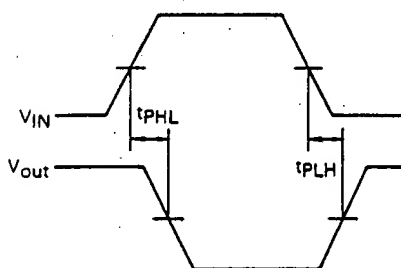
| | |
|------------------------|--|
| I_{CC} | Supply Current — The current flowing into the V _{CC} supply terminal of a circuit with the specified input conditions and the outputs open. When not specified, input conditions are chosen to guarantee worst case operation. |
| I_{IH} | Input HIGH current — The current flowing into an input when a specified HIGH voltage is applied. |
| I_{IL} | Input LOW current — The current flowing out of an input when a specified LOW voltage is applied. |
| I_{OH} | Output HIGH current — The leakage current flowing into a turned off open collector output with a specified HIGH output voltage applied. For devices with a pull-up circuit, the I _{OH} is the current flowing out of an output which is in the HIGH state. |
| I_{OL} | Output LOW current — The current flowing into an output which is in the LOW state. |
| I_{OS} | Output short-circuit current — The current flowing out of an output which is in the HIGH state when that output is short circuit to ground (or other specified potential). |
| I_{OZH} | Output off current HIGH — The current flowing into a disabled 3-state output with a specified HIGH output voltage applied. |
| I_{OZL} | Output off current LOW — The current flowing out of a disabled 3-state output with a specified LOW output voltage applied. |

VOLTAGES — All voltages are referenced to ground. Negative voltage limits are specified as absolute values (*i.e.*, -10 V is greater than -1.0 V).

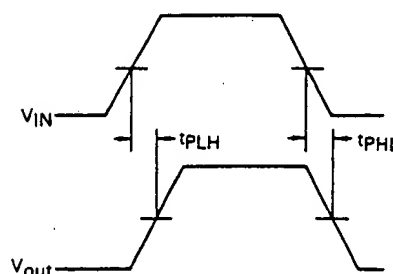
| | |
|----------------------------|---|
| V_{CC} | Supply voltage — The range of power supply voltage over which the device is guaranteed to operate within the specified limits. |
| V_{IK(MAX)} | Input clamp diode voltage — The most negative voltage at an input when 18 mA is forced out of that input terminal. This parameter guarantees the integrity of the input diode which is intended to clamp negative ringing at the input terminal. |
| V_{IH} | Input HIGH voltage — The range of input voltages that represents a logic HIGH in the system. |
| V_{IH(MIN)} | Minimum input HIGH voltage — The minimum allowed input HIGH in a logic system. This value represents the guaranteed input HIGH threshold for the device. |
| V_{IL} | Input LOW voltage — The range of input voltages that represents a logic LOW in the system. |
| V_{IL(MAX)} | Maximum input LOW voltage — The maximum allowed input LOW in a system. This value represents the guaranteed input LOW threshold for the device. |
| V_{OH(MIN)} | Output HIGH voltage — The minimum voltage at an output terminal for the specified output current I _{OH} and at the minimum value of V _{CC} . |
| V_{OL(MAX)} | Output LOW voltage — The maximum voltage at an output terminal sinking the maximum specified load current I _{OL} . |
| V_{T+} | Positive-going threshold voltage — The input voltage of a variable threshold device (<i>i.e.</i> , Schmitt Trigger) that is interpreted as a V _{IH} as the input transition rises from below V _{T-(MIN)} . |
| V_{T-} | Negative-going threshold voltage — The input voltage of a variable threshold device (<i>i.e.</i> , Schmitt Trigger) that is interpreted as a V _{IL} as the input transition falls from above V _{T+(MAX)} . |

- t_{PLH}** Propagation delay LOW-TO-HIGH:
The time delay from when the input is 1.3 V (1.5 for FAST) to when the output reaches 1.3 V (1.5 for FAST), while the output changes to a logic HIGH.
- t_{PLH}** Propagation delay HIGH-TO-LOW:
The time delay from when the input is 1.3 V (1.5 for FAST) to when the output reaches 1.3 V (1.5 for FAST), while the output changes to a logic LOW.

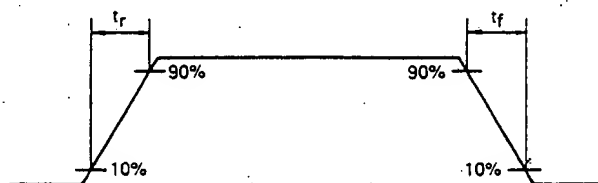
For Inverting Function



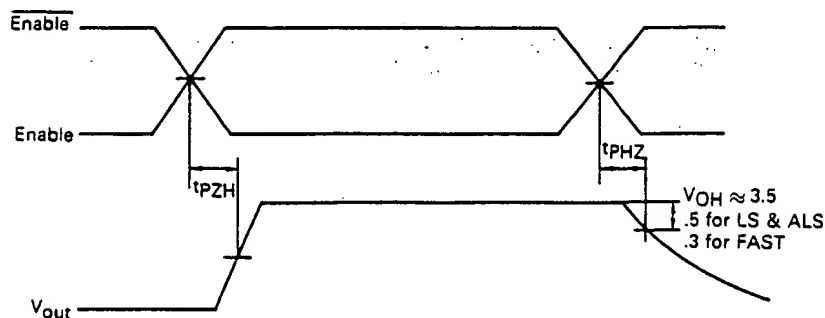
For Non Inverting



- t_r** Waveform Rise Time:
LOW to HIGH logic transition time, measured from the 10% to 90% points of the waveform.
- t_f** Waveform Fall Time:
HIGH to LOW logic transition time, measured the 90% to the 10% points of the waveform.



- t_{PHZ}** Output disable time: HIGH to Z
The time delay between the specified amplitude point on the enable input and when the output falls 0.5 V (0.3 V for FAST) from the steady-state HIGH level.
- t_{PZH}** Output enable time: Z to HIGH
The time delay between the specified amplitude points on the enable input and the output, when the output is going from a disabled state to a logic HIGH state.



tPLZ

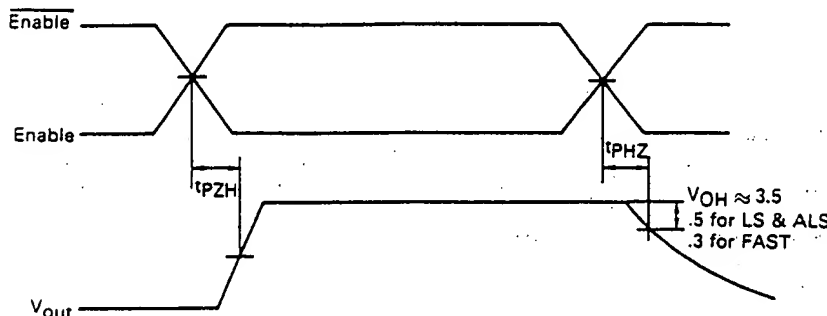
Output disable time: LOW to Z

The time delay between the specified amplitude point on the enable input and when the output rises 0.5 V (0.3 V for FAST) from the steady-state LOW level.

tPZL

Output enable time: Z to LOW

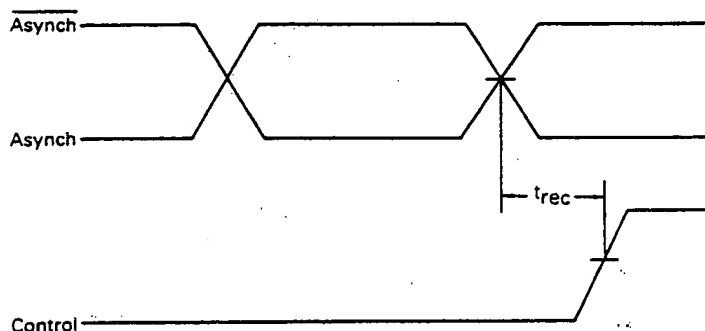
The time delay between the specified amplitude points on the enable input and the output when the output is going from a disabled state to a logic LOW state.



trec

Recovery time

Time required between an asynchronous signal (SET, RESET, CLEAR or PARALLEL load) and the active edge of a synchronous control signal, to insure that the device will properly respond to the synchronous signal.



t_h

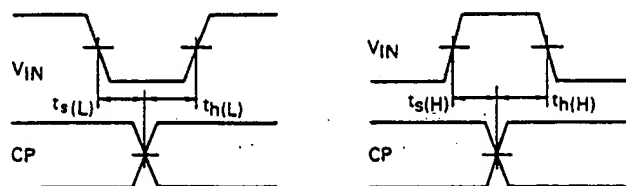
Hold Time

The interval of time from the active edge of the control signal (usually the clock) to when the data to be recognized is no longer required to ensure proper interpretation of the data. A negative hold time indicates that the data may be removed at some time prior to the active edge of the control signal.

t_s

Setup time

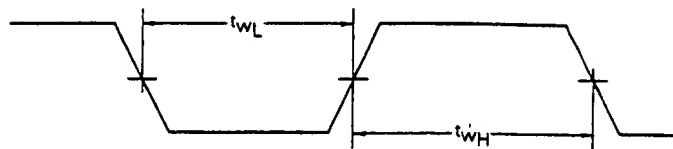
The interval of time during which the data to be recognized is required to remain constant prior to the active edge of the control signal to ensure proper data recognition.



t_w or
 t_{pw}

Pulse width

The time between the specified amplitude points (1.3 V for LS & ALS, 1.0 V for FAST) on the leading and trailing edges of a pulse.



f_{MAX}

Toggle frequency/operating frequency

The maximum rate at which clock pulses meeting the clock requirements (i.e., t_{WH} , t_{WL} , and t_r , t_f) may be applied to a sequential circuit. Above this frequency the device may cease to function.

f_{MAXmin}

Guaranteed maximum clock frequency

The lowest possible value for f_{MAX} .

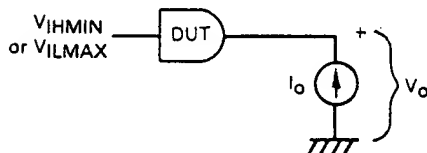
3

TESTING

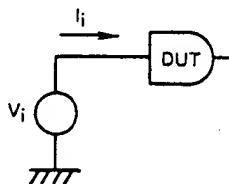
DC TEST CIRCUITS

The following test circuits and forcing functions represent Motorola's typical DC test procedures.

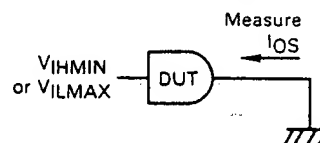
V_{OH} AND V_{OL} TESTS
Force I_{OHMAX} or I_{OLMAX}
Measure V_{OH} or V_{OL}



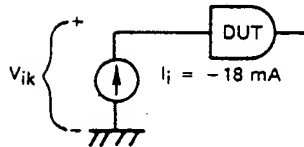
I_{IH} , $I_{IH'}$ AND I_{IL} TESTS
Force 7.0, 5.5, 2.7, or 0.4 V
Measure I_{IH} , $I_{IH'}$ or I_{IL}



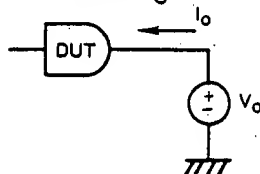
I_{OS} TEST*



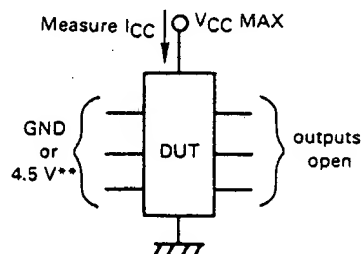
V_{IK} TEST
Force I_i
Measure V_{IK}



I_{OH} , $I_{OZH'}$ AND I_{OZL} TESTS
Force 5.5, 2.4, or 0.4 V
Measure I_O



I_{CC} TEST



*The test for I_O (ALS devices) is performed in the same manner as I_{OS} except 2.25 volts is forced on the output instead of 0.0 V.
**Unless otherwise indicated, input conditions are selected to produce a worst case condition.

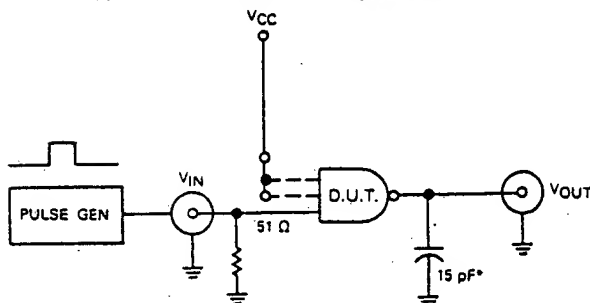
AC TEST CIRCUITS The test circuits and conditions represent typical test procedures. AC waveforms and terminology can be found on pages 3-8 to 3-10.

Proper testing requires that care be taken in the construction of AC test fixtures. This is especially true of FAST™ TTL.

Maintaining a 50 Ω environment on the ac test fixture, as well as the use of multilayer boards with internal V_{CC} and ground planes is highly recommended for FAST™ TTL. Bypassing with both electrolytic and high quality RF type capacitors should be provided on the board. Lead lengths for all components should be kept as short as possible (Motorola uses and recommends chip capacitors and resistors for ac test fixtures). Following these rules will result in cleaner waveforms as well as better correlation between Motorola and the FAST™ TTL consumer.

LS TEST CIRCUITS

Test Circuit for Standard Output Devices

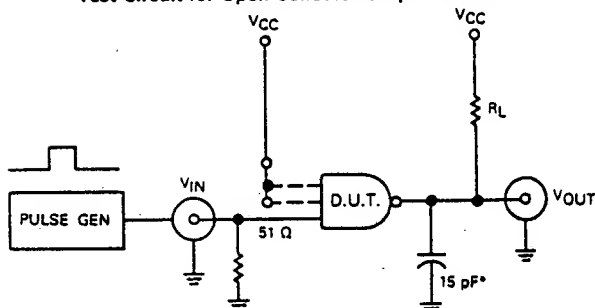


PULSE GENERATOR SETTINGS (UNLESS OTHERWISE SPECIFIED)

| | LS | ALS | FAST |
|------------------|------------|----------|----------|
| Frequency = | 1MHZ | 1MHZ | 1MHZ |
| Duty Cycle = | 50% | 50% | 50% |
| 1TLH (t_r) = | 6 ns (15)* | 6ns | 2.5ns |
| 1THL (t_f) = | 6ns (15)* | 6ns | 2.5ns |
| Amplitude = | 0 to 3 V | 0 to 3 V | 0 to 3 V |

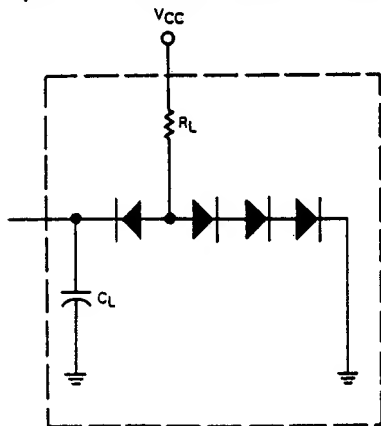
*The specified propagation delay limits can be guaranteed with a 15 ns input rise time on all parameters except those requiring narrow pulse widths. Any frequency measurement over 15 MHz or pulse width less than 30 ns must be performed with a 6 ns input rise time.

Test Circuit for Open Collector Output Devices

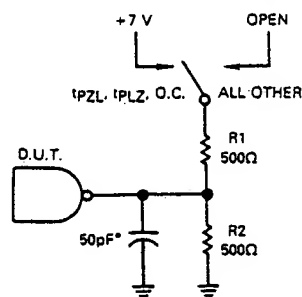


*includes all probe and jig capacitance

Optional LS Load (Guaranteed—Not Tested)



ALS and FAST TEST CIRCUITS



*includes all probe and jig capacitance

Note: for ALS open collector outputs with $I_{OL} = 8$ mA, replace R_1 and R_2 with 1000 Ω resistors.

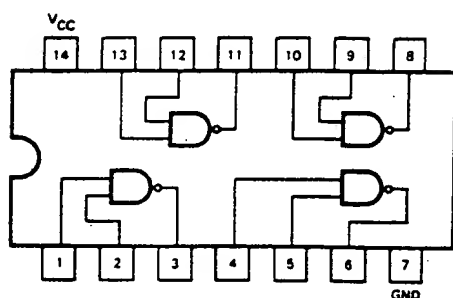
SCHOTTKY TTL

LS Data Sheets





SN54LS00
SN74LS00



J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

QUAD 2-INPUT NAND GATE
LOW POWER SCHOTTKY

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I _{OH} | Output Current — High | 54, 74 | | | -0.4 | mA |
| I _{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

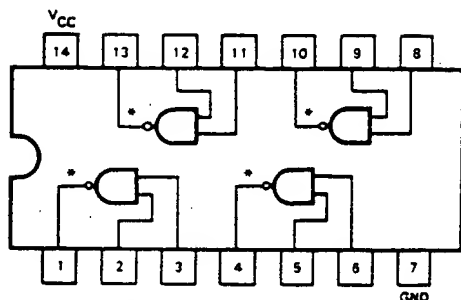
| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------------|---|--------|-------|------|-------|--|
| | | MIN | TYP | MAX | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V _{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V _{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA |
| V _{OH} | Output HIGH Voltage | 54 | 2.5 | 3.5 | V | V _{CC} = MIN, I _{OH} = MAX, V _{IN} = V _{IH} or V _{IL} per Truth Table |
| | | 74 | 2.7 | 3.5 | V | |
| V _{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | I _{OL} = 4.0 mA |
| | | 74 | 0.35 | 0.5 | V | I _{OL} = 8.0 mA |
| I _{IH} | Input HIGH Current | | | 20 | μA | V _{CC} = MAX, V _{IN} = 2.7 V |
| | | | | 0.1 | mA | V _{CC} = MAX, V _{IN} = 7.0 V |
| I _{IL} | Input LOW Current | | | -0.4 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| I _{OS} | Short Circuit Current | -20 | | -100 | mA | V _{CC} = MAX |
| I _{CC} | Power Supply Current Total, Output HIGH Total, Output LOW | | | 1.6 | mA | V _{CC} = MAX |
| | | | | 4.4 | | |

AC CHARACTERISTICS: T_A = 25°C

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------|---------------------------------|--------|-----|-----|-------|---|
| | | MIN | TYP | MAX | | |
| t _{PLH} | Turn Off Delay, Input to Output | | 9.0 | 15 | ns | V _{CC} = 5.0 V C _L = 15 pF |
| t _{PHL} | Turn On Delay, Input to Output | | 10 | 15 | ns | |



MOTOROLA



*OPEN COLLECTOR OUTPUTS

J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

SN54LS01
SN74LS01

QUAD 2-INPUT NAND GATE
LOW POWER SCHOTTKY

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| V _{OH} | Output Voltage — High | 54, 74 | | | 5.5 | V |
| I _{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

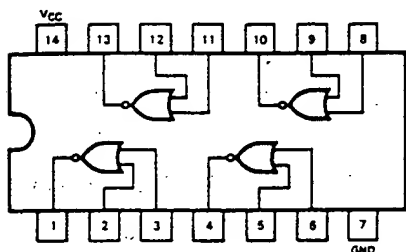
| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------------|---|--------|-------|------|-------|---|
| | | MIN | TYP | MAX | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V _{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V _{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA |
| I _{OH} | Output HIGH Current | 54, 74 | | 100 | μA | V _{CC} = MIN, V _{OH} = MAX |
| V _{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | I _{OL} = 4.0 mA, V _{CC} = V _{CC} MIN, V _{IN} = V _{IL} or V _{IH} per Truth Table |
| | | 74 | 0.35 | 0.5 | V | I _{OL} = 8.0 mA |
| I _{IH} | Input HIGH Current | | | 20 | μA | V _{CC} = MAX, V _{IN} = 2.7 V |
| | | | | 0.1 | mA | V _{CC} = MAX, V _{IN} = 7.0 V |
| I _{IL} | Input LOW Current | | | -0.4 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| I _{CC} | Power Supply Current Total, Output HIGH Total, Output LOW | | | 1.6 | mA | V _{CC} = MAX |
| | | | | 4.4 | | |

AC CHARACTERISTICS: T_A = 25°C

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------|---------------------------------|--------|-----|-----|-------|--|
| | | MIN | TYP | MAX | | |
| t _{PLH} | Turn Off Delay, Input to Output | | 17 | 32 | ns | V _{CC} = 5.0 V C _L = 15 pF, R _L = 2.0 kΩ |
| t _{PHL} | Turn On Delay, Input to Output | | 15 | 28 | ns | |



MOTOROLA



J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 648-05 (Plastic)

SN54LS02
SN74LS02

QUAD 2-INPUT NOR GATE

LOW POWER SCHOTTKY

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I _{OH} | Output Current — High | 54, 74 | | | -0.4 | mA |
| I _{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------------|---|--------|-------|------|-------|---|
| | | MIN | TYP | MAX | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V _{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V _{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA |
| V _{OH} | Output HIGH Voltage | 54 | 2.5 | 3.5 | V | V _{CC} = MIN, I _{OH} = MAX, V _{IN} = V _{IH} or V _{IL} per Truth Table |
| | | 74 | 2.7 | 3.5 | V | |
| V _{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | I _{OL} = 4.0 mA, V _{CC} = V _{CC} MIN, V _{IN} = V _{IL} or V _{IH} per Truth Table |
| | | 74 | 0.35 | 0.5 | V | |
| I _{IH} | Input HIGH Current | | | 20 | μA | V _{CC} = MAX, V _{IN} = 2.7 V |
| | | | | 0.1 | mA | V _{CC} = MAX, V _{IN} = 7.0 V |
| I _{IL} | Input LOW Current | | | -0.4 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| I _{OS} | Short Circuit Current | -20 | | -100 | mA | V _{CC} = MAX |
| I _{CC} | Power Supply Current Total, Output HIGH Total, Output LOW | | | 3.2 | mA | V _{CC} = MAX |
| | | | | 5.4 | | |

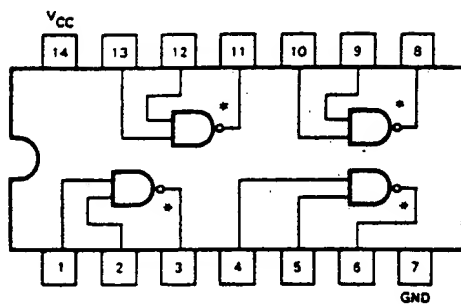
AC CHARACTERISTICS: T_A = 25°C

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------|---------------------------------|--------|-----|-----|-------|---|
| | | MIN | TYP | MAX | | |
| t _{PLH} | Turn Off Delay, Input to Output | | 10 | 15 | ns | V _{CC} = 5.0 V C _L = 15 pF |
| t _{PHL} | Turn On Delay, Input to Output | | 10 | 15 | ns | |

MOTOROLA SCHOTTKY TTL DEVICES



MOTOROLA



*OPEN COLLECTOR OUTPUTS

J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

SN54LS03
SN74LS03

QUAD 2-INPUT NAND GATE

LOW POWER SCHOTTKY

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| V _{OH} | Output Voltage — High | 54, 74 | | | 5.5 | V |
| I _{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

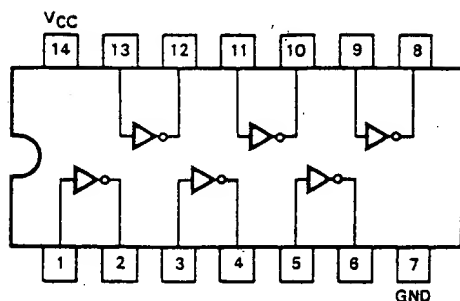
| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------------|---|--------|-------|------|-------|---|
| | | MIN | TYP | MAX | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V _{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V _{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA |
| I _{OH} | Output HIGH Current | 54, 74 | | 100 | μA | V _{CC} = MIN, V _{OH} = MAX |
| V _{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | I _{OL} = 4.0 mA |
| | | 74 | 0.35 | 0.5 | V | I _{OL} = 8.0 mA |
| I _{IH} | Input HIGH Current | | | 20 | μA | V _{CC} = MAX, V _{IN} = 2.7 V |
| | | | | 0.1 | mA | V _{CC} = MAX, V _{IN} = 7.0 V |
| I _{IL} | Input LOW Current | | | -0.4 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| I _{CC} | Power Supply Current Total, Output HIGH Total, Output LOW | | | 1.6 | mA | V _{CC} = MAX |
| | | | | 4.4 | | |

AC CHARACTERISTICS: T_A = 25°C

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------|---------------------------------|--------|-----|-----|-------|--|
| | | MIN | TYP | MAX | | |
| t _{PLH} | Turn Off Delay, Input to Output | | 17 | 32 | ns | V _{CC} = 5.0 V C _L = 15 pF, R _L = 2.0 kΩ |
| t _{PHL} | Turn On Delay, Input to Output | | 15 | 28 | ns | |



MOTOROLA



J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

SN54LS04
SN74LS04

HEX INVERTER

LOW POWER SCHOTTKY

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I _{OH} | Output Current — High | 54, 74 | | | -0.4 | mA |
| I _{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

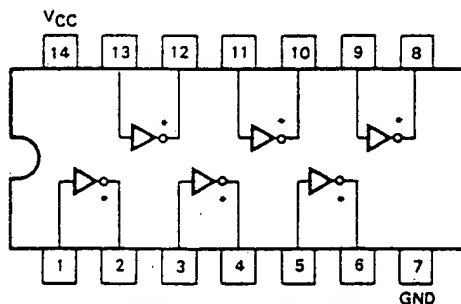
| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------------|---|--------|-------|------|-------|---|
| | | MIN | TYP | MAX | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V _{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V _{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA |
| V _{OH} | Output HIGH Voltage | 54 | 2.5 | 3.5 | V | V _{CC} = MIN, I _{OH} = MAX, V _{IN} = V _{IH} or V _{IL} per Truth Table |
| | | 74 | 2.7 | 3.5 | V | |
| V _{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | I _{OL} = 4.0 mA, V _{CC} = V _{CC} MIN, V _{IN} = V _{IL} or V _{IH} per Truth Table |
| | | 74 | 0.35 | 0.5 | V | I _{OL} = 8.0 mA |
| I _{IH} | Input HIGH Current | | | 20 | μA | V _{CC} = MAX, V _{IN} = 2.7 V |
| | | | | 0.1 | mA | V _{CC} = MAX, V _{IN} = 7.0 V |
| I _{IL} | Input LOW Current | | | -0.4 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| I _{OS} | Short Circuit Current | -20 | | -100 | mA | V _{CC} = MAX |
| I _{CC} | Power Supply Current Total, Output HIGH Total, Output LOW | | | 2.4 | mA | V _{CC} = MAX |
| | | | | 8.6 | | |

AC CHARACTERISTICS: T_A = 25°C

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------|---------------------------------|--------|-----|-----|-------|---|
| | | MIN | TYP | MAX | | |
| t _{PLH} | Turn Off Delay, Input to Output | | 9.0 | 15 | ns | V _{CC} = 5.0 V C _L = 15 pF |
| t _{PHL} | Turn On Delay, Input to Output | | 10 | 15 | ns | |



MOTOROLA



• OPEN COLLECTOR OUTPUTS

J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

SN54LS05
SN74LS05

HEX INVERTER

LOW POWER SCHOTTKY

GUARANTEED OPERATING RANGES

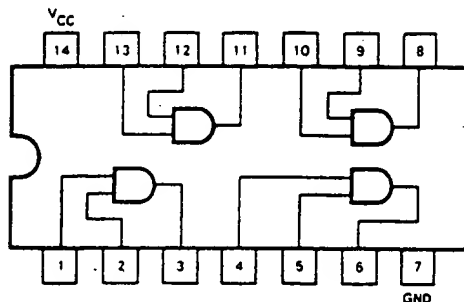
| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| V _{OH} | Output Voltage — High | 54, 74 | | | 5.5 | V |
| I _{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------------|---|--------|-------|------------|-------|---|
| | | MIN | TYP | MAX | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V _{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V _{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA |
| I _{OH} | Output HIGH Current | 54, 74 | | 100 | μA | V _{CC} = MIN, V _{OH} = MAX |
| V _{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | I _{OL} = 4.0 mA |
| | | 74 | 0.35 | 0.5 | V | I _{OL} = 8.0 mA |
| I _{IH} | Input HIGH Current | | | 20 | μA | V _{CC} = MAX, V _{IN} = 2.7 V |
| I _{IL} | Input LOW Current | | | 0.1 | mA | V _{CC} = MAX, V _{IN} = 7.0 V |
| I _{CC} | Power Supply Current Total, Output HIGH Total, Output LOW | | | -0.4 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| | | | | 2.4 6.6 | mA | V _{CC} = MAX |

AC CHARACTERISTICS: T_A = 25°C

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------|---------------------------------|--------|-----|-----|-------|--|
| | | MIN | TYP | MAX | | |
| t _{PLH} | Turn Off Delay, Input to Output | | 17 | 32 | ns | V _{CC} = 5.0 V C _L = 15 pF, R _L = 2.0 kΩ |
| t _{PHL} | Turn On Delay, Input to Output | | 15 | 28 | ns | |



J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

SN54LS08
SN74LS08

QUAD 2-INPUT AND GATE
LOW POWER SCHOTTKY

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|----------|-------------------------------------|----------|-------------|------------|-------------|------|
| V_{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T_A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I_{OH} | Output Current — High | 54, 74 | | | -0.4 | mA |
| I_{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

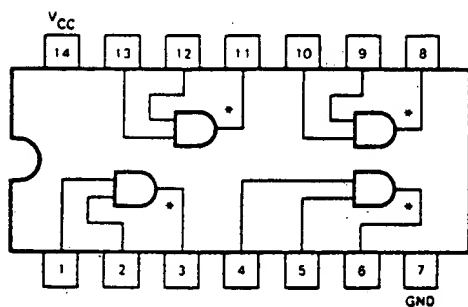
| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|----------|---|--------|-------|------|---------------|---|
| | | MIN | TYP | MAX | | |
| V_{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V_{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V_{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | $V_{CC} = \text{MIN}$, $I_{IN} = -18 \text{ mA}$ |
| V_{OH} | Output HIGH Voltage | 54 | 2.5 | 3.5 | V | $V_{CC} = \text{MIN}$, $I_{OH} = \text{MAX}$, $V_{IN} = V_{IH}$ or V_{IL} per Truth Table |
| | | 74 | 2.7 | 3.5 | V | |
| V_{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | $I_{OL} = 4.0 \text{ mA}$, $V_{CC} = V_{CC} \text{ MIN}$, $V_{IN} = V_{IL}$ or V_{IH} per Truth Table |
| | | 74 | 0.35 | 0.5 | V | $I_{OL} = 8.0 \text{ mA}$ |
| I_{IH} | Input HIGH Current | | | 20 | μA | $V_{CC} = \text{MAX}$, $V_{IN} = 2.7 \text{ V}$ |
| | | | | 0.1 | mA | $V_{CC} = \text{MAX}$, $V_{IN} = 7.0 \text{ V}$ |
| I_{IL} | Input LOW Current | | | -0.4 | mA | $V_{CC} = \text{MAX}$, $V_{IN} = 0.4 \text{ V}$ |
| I_{OS} | Short Circuit Current | -20 | | -100 | mA | $V_{CC} = \text{MAX}$ |
| I_{CC} | Power Supply Current Total, Output HIGH Total, Output LOW | | | 4.8 | mA | $V_{CC} = \text{MAX}$ |
| | | | | 8.8 | | |

AC CHARACTERISTICS: $T_A = 25^\circ\text{C}$

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------|---------------------------------|--------|-----|-----|-------|---|
| | | MIN | TYP | MAX | | |
| t_{PLH} | Turn Off Delay, Input to Output | | 8.0 | 15 | ns | $V_{CC} = 5.0 \text{ V}$ $C_L = 15 \text{ pF}$ |
| t_{PHL} | Turn On Delay, Input to Output | | 10 | 20 | ns | |



MOTOROLA



*OPEN COLLECTOR OUTPUTS

J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

SN54LS09
SN74LS09

QUAD 2-INPUT AND GATE
LOW POWER SCHOTTKY

GUARANTEED OPERATING RANGES

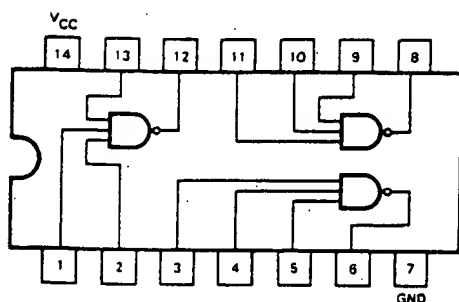
| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| V _{OH} | Output Voltage — High | 54, 74 | | | 5.5 | V |
| I _{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------------|---|--------|-------|------|-------|---|
| | | MIN | TYP | MAX | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V _{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V _{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA |
| I _{OH} | Output HIGH Current | 54, 74 | | 100 | μA | V _{CC} = MIN, V _{OH} = MAX |
| V _{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | I _{OL} = 4.0 mA, V _{CC} = V _{CC} MIN, V _{IN} = V _{IL} or V _{IH} per Truth Table |
| | | 74 | 0.35 | 0.5 | V | I _{OL} = 8.0 mA |
| I _{IH} | Input HIGH Current | | | 20 | μA | V _{CC} = MAX, V _{IN} = 2.7 V |
| | | | | 0.1 | mA | V _{CC} = MAX, V _{IN} = 7.0 V |
| I _{IL} | Input LOW Current | | | -0.4 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| I _{CC} | Power Supply Current Total, Output HIGH Total, Output LOW | | | 4.8 | mA | V _{CC} = MAX |
| | | | | 8.8 | | |

AC CHARACTERISTICS: T_A = 25°C

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------|---------------------------------|--------|-----|-----|-------|--|
| | | MIN | TYP | MAX | | |
| t _{PLH} | Turn Off Delay, Input to Output | | 20 | 35 | ns | V _{CC} = 5.0 V C _L = 15 pF, R _L = 2.0 kΩ |
| t _{PHL} | Turn On Delay, Input to Output | | 17 | 35 | ns | |



J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

SN54LS10
SN74LS10

TRIPLE 3-INPUT NAND GATE
LOW POWER SCHOTTKY

GUARANTEED OPERATING RANGES

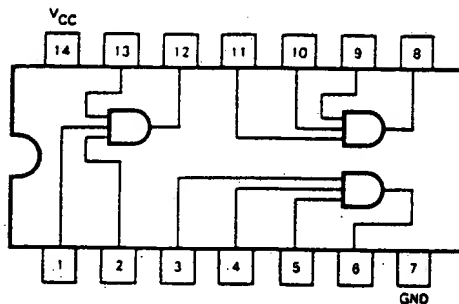
| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I _{OH} | Output Current — High | 54, 74 | | | -0.4 | mA |
| I _{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------------|---|--------|-------|------|-------|---|
| | | MIN | TYP | MAX | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V _{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V _{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA |
| V _{OH} | Output HIGH Voltage | 54 | 2.5 | 3.5 | V | V _{CC} = MIN, I _{OH} = MAX, V _{IN} = V _{IH} or V _{IL} per Truth Table |
| | | 74 | 2.7 | 3.5 | V | |
| V _{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | I _{OL} = 4.0 mA, V _{CC} = V _{CC} MIN, V _{IN} = V _{IL} or V _{IH} per Truth Table |
| | | 74 | 0.35 | 0.5 | V | I _{OL} = 8.0 mA |
| I _{IH} | Input HIGH Current | | | 20 | μA | V _{CC} = MAX, V _{IN} = 2.7 V |
| | | | | 0.1 | mA | V _{CC} = MAX, V _{IN} = 7.0 V |
| I _{IL} | Input LOW Current | | | -0.4 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| I _{OS} | Short Circuit Current | -20 | | -100 | mA | V _{CC} = MAX |
| I _{CC} | Power Supply Current Total, Output HIGH Total, Output LOW | | | 1.2 | mA | V _{CC} = MAX |
| | | | | 3.3 | | |

AC CHARACTERISTICS: T_A = 25°C

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------|---------------------------------|--------|-----|-----|-------|---|
| | | MIN | TYP | MAX | | |
| t _{PLH} | Turn Off Delay, Input to Output | | 9.0 | 15 | ns | V _{CC} = 5.0 V C _L = 15 pF |
| t _{PHL} | Turn On Delay, Input to Output | | 10 | 15 | ns | |



J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

SN54LS11
SN74LS11

TRIPLE 3-INPUT AND GATE
LOW POWER SCHOTTKY

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|----------|-------------------------------------|----------|-------------|------------|-------------|------|
| V_{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T_A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I_{OH} | Output Current — High | 54, 74 | | | -0.4 | mA |
| I_{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

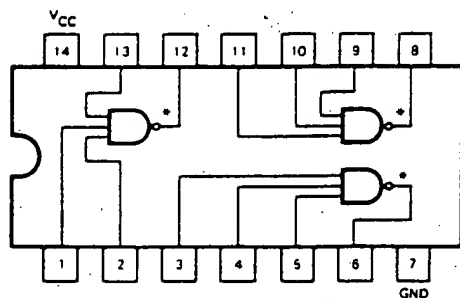
| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|----------|---|--------|-------|------|---------------|---|
| | | MIN | TYP | MAX | | |
| V_{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V_{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V_{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | $V_{CC} = \text{MIN}$, $I_{IN} = -18 \text{ mA}$ |
| V_{OH} | Output HIGH Voltage | 54 | 2.5 | 3.5 | V | $V_{CC} = \text{MIN}$, $I_{OH} = \text{MAX}$, $V_{IN} = V_{IH}$ or V_{IL} per Truth Table |
| | | 74 | 2.7 | 3.5 | V | |
| V_{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | $I_{OL} = 4.0 \text{ mA}$, $V_{CC} = V_{CC} \text{ MIN}$, $V_{IN} = V_{IL}$ or V_{IH} per Truth Table |
| | | 74 | 0.35 | 0.5 | V | $I_{OL} = 8.0 \text{ mA}$ |
| I_{IH} | Input HIGH Current | | | 20 | μA | $V_{CC} = \text{MAX}$, $V_{IN} = 2.7 \text{ V}$ |
| I_{IL} | Input LOW Current | | | 0.1 | mA | $V_{CC} = \text{MAX}$, $V_{IN} = 7.0 \text{ V}$ |
| I_{IL} | Input LOW Current | | | -0.4 | mA | $V_{CC} = \text{MAX}$, $V_{IN} = 0.4 \text{ V}$ |
| I_{OS} | Short Circuit Current | -20 | | -100 | mA | $V_{CC} = \text{MAX}$ |
| I_{CC} | Power Supply Current Total, Output HIGH Total, Output LOW | | | 3.6 | mA | $V_{CC} = \text{MAX}$ |
| | | | | 8.6 | | |

AC CHARACTERISTICS: $T_A = 25^\circ\text{C}$

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------|---------------------------------|--------|-----|-----|-------|--------------------------|
| | | MIN | TYP | MAX | | |
| t_{PLH} | Turn Off Delay, Input to Output | | 8.0 | 15 | ns | $V_{CC} = 5.0 \text{ V}$ |
| t_{PHL} | Turn On Delay, Input to Output | | 10 | 20 | ns | $C_L = 15 \text{ pF}$ |



MOTOROLA



*OPEN COLLECTOR OUTPUT

J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

SN54LS12
SN74LS12

TRIPLE 3-INPUT NAND GATE

LOW POWER SCHOTTKY

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| V _{OH} | Output Voltage — High | 54, 74 | | | 5.5 | V |
| I _{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------------|---|--------|-------|------|-------|---|
| | | MIN | TYP | MAX | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V _{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V _{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA |
| I _{OH} | Output HIGH Current | 54, 74 | | 100 | μA | V _{CC} = MIN, V _{OH} = MAX |
| V _{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | I _{OL} = 4.0 mA |
| | | 74 | 0.35 | 0.5 | V | I _{OL} = 8.0 mA |
| I _{IH} | Input HIGH Current | | | 20 | μA | V _{CC} = MAX, V _{IN} = 2.7 V |
| | | | | 0.1 | mA | V _{CC} = MAX, V _{IN} = 7.0 V |
| I _{IL} | Input LOW Current | | | -0.4 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| I _{CC} | Power Supply Current Total, Output HIGH Total, Output LOW | | | 1.4 | mA | V _{CC} = MAX |
| | | | | 3.3 | | |

AC CHARACTERISTICS: T_A = 25°C

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------|---------------------------------|--------|-----|-----|-------|--|
| | | MIN | TYP | MAX | | |
| t _{PLH} | Turn Off Delay, Input to Output | | 17 | 32 | ns | V _{CC} = 5.0 V C _L = 15 pF, R _L = 2.0 kΩ |
| t _{PHL} | Turn On Delay, Input to Output | | 15 | 28 | ns | |



MOTOROLA

SN54LS/74LS13 SN54LS/74LS14

DESCRIPTION — The SN54LS/74LS13 and SN54LS/74LS14 contain logic gates/inverters which accept standard TTL input signals and provide standard TTL output levels. They are capable of transforming slowly changing input signals into sharply defined, jitter-free output signals. Additionally, they have greater noise margin than conventional inverters.

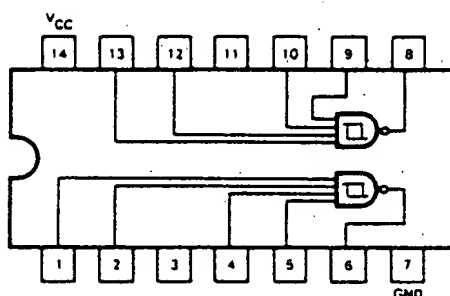
Each circuit contains a Schmitt trigger followed by a Darlington level shifter and a phase splitter driving a TTL totem pole output. The Schmitt trigger uses positive feedback to effectively speed-up slow input transitions, and provide different input threshold voltages for positive and negative-going transitions. This hysteresis between the positive-going and negative-going input thresholds (typically 800 mV) is determined internally by resistor ratios and is essentially insensitive to temperature and supply voltage variations.

SCHMITT TRIGGERS DUAL GATE/HEX INVERTER

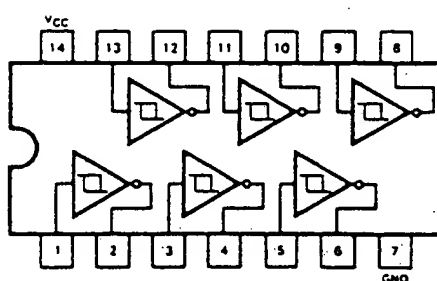
LOW POWER SCHOTTKY

LOGIC AND CONNECTION DIAGRAMS

SN54LS/74LS13



SN54LS/74LS14



J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

GUARANTEED OPERATING RANGES

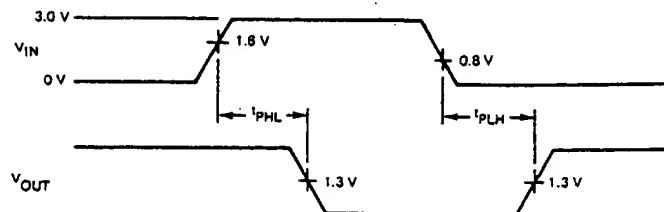
| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I _{OH} | Output Current — High | 54, 74 | | | -0.4 | mA |
| I _{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-------------------|---|--------|-------|------|---------|--|
| | | MIN | TYP | MAX | | |
| V_{T+} | Positive-Going Threshold Voltage | 1.5 | | 2.0 | V | $V_{CC} = 5.0$ V |
| V_{T-} | Negative-Going Threshold Voltage | 0.6 | | 1.1 | V | $V_{CC} = 5.0$ V |
| $V_{T+} - V_{T-}$ | Hysteresis | 0.4 | 0.8 | | V | $V_{CC} = 5.0$ V |
| V_{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | $V_{CC} = \text{MIN}$, $I_{IN} = -18$ mA |
| V_{OH} | Output HIGH Voltage | 54 | 2.5 | 3.4 | V | $V_{CC} = \text{MIN}$, $I_{OH} = -400$ μ A, $V_{IN} = V_{IL}$ |
| | | 74 | 2.7 | 3.4 | | |
| V_{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | $V_{CC} = \text{MIN}$, $I_{OL} = 4.0$ mA, $V_{IN} = 2.0$ V |
| | | 74 | 0.35 | 0.5 | V | $V_{CC} = \text{MIN}$, $I_{OL} = 8.0$ mA, $V_{IN} = 2.0$ V |
| I_{T+} | Input Current at Positive-Going Threshold | | -0.14 | | mA | $V_{CC} = 5.0$ V, $V_{IN} = V_{T+}$ |
| I_{T-} | Input Current at Negative-Going Threshold | | -0.18 | | mA | $V_{CC} = 5.0$ V, $V_{IN} = V_{T-}$ |
| I_{IH} | Input HIGH Current | | 1.0 | 20 | μ A | $V_{CC} = \text{MAX}$, $V_{IN} = 2.7$ V |
| | | | | 0.1 | mA | $V_{CC} = \text{MAX}$, $V_{IN} = 7.0$ V |
| I_{IL} | Input LOW Current | | | -0.4 | mA | $V_{CC} = \text{MAX}$, $V_{IN} = 0.4$ V |
| I_{OS} | Short Circuit Current | -20 | | -100 | mA | $V_{CC} = \text{MAX}$, $V_{OUT} = 0$ V |
| I_{CC} | Power Supply Current Total, Output HIGH | LS13 | 2.9 | 6.0 | mA | $V_{CC} = \text{MAX}$ |
| | | LS14 | 8.6 | 16 | | |
| | Total, Output LOW | LS13 | 4.1 | 7.0 | | |
| | | LS14 | 12 | 21 | | |

AC CHARACTERISTICS: $T_A = 25^\circ\text{C}$

| SYMBOL | PARAMETER | MAX | | UNITS | TEST CONDITIONS |
|-----------|------------------------------------|------|------|-------|-----------------------------------|
| | | LS13 | LS14 | | |
| t_{PLH} | Propagation Delay, Input to Output | 22 | 22 | ns | $V_{CC} = 5.0$ V $C_L = 15$ pF |
| t_{PHL} | Propagation Delay, Input to Output | 27 | 22 | ns | |



V_{IN} VERSUS V_{OUT}
TRANSFER FUNCTION

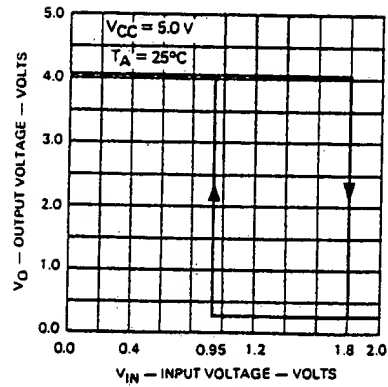


Fig. 1

THRESHOLD VOLTAGE AND HYSTERESIS
VERSUS
POWER SUPPLY VOLTAGE

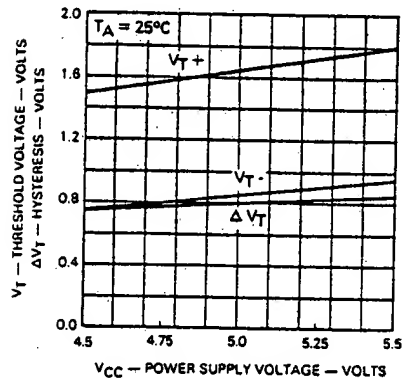


Fig. 2

THRESHOLD VOLTAGE HYSTERESIS
VERSUS
TEMPERATURE

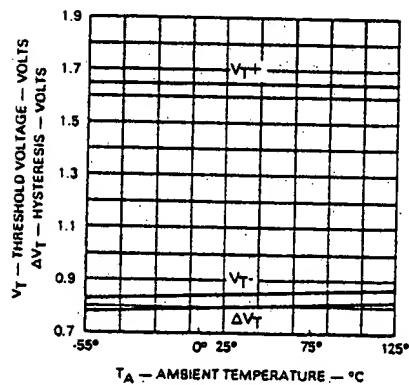
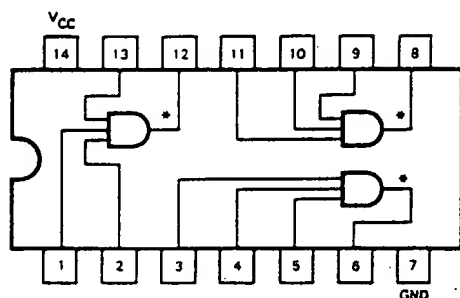


Fig. 3



SN54LS15 **SN74LS15**



*OPEN COLLECTOR OUTPUTS

J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 648-05 (Plastic)

TRIPLE 3-INPUT AND GATE
LOW POWER SCHOTTKY

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| V _{OH} | Output Voltage — High | 54, 74 | | | 5.5 | V |
| I _{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

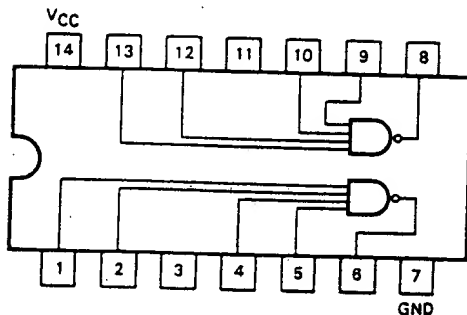
| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------------|---|--------|-------|------|-------|---|
| | | MIN | TYP | MAX | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V _{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V _{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA |
| I _{OH} | Output HIGH Current | 54, 74 | | 100 | μA | V _{CC} = MIN, V _{OH} = MAX |
| V _{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | I _{OL} = 4.0 mA, V _{CC} = V _{CC} MIN, V _{IN} = V _{IL} or V _{IH} per Truth Table |
| | | 74 | 0.35 | 0.5 | V | I _{OL} = 8.0 mA |
| I _{IH} | Input HIGH Current | | | 20 | μA | V _{CC} = MAX, V _{IN} = 2.7 V |
| | | | | 0.1 | mA | V _{CC} = MAX, V _{IN} = 7.0 V |
| I _{IL} | Input LOW Current | | | -0.4 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| I _{CC} | Power Supply Current Total, Output HIGH Total, Output LOW | | | 3.6 | mA | V _{CC} = MAX |
| | | | | 6.6 | | |

AC CHARACTERISTICS: T_A = 25°C

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------|---------------------------------|--------|-----|-----|-------|--|
| | | MIN | TYP | MAX | | |
| t _{PLH} | Turn Off Delay, Input to Output | | 20 | 35 | ns | V _{CC} = 5.0 V C _L = 15 pF, R _L = 2.0 kΩ |
| t _{PHL} | Turn On Delay, Input to Output | | 17 | 35 | ns | |



MOTOROLA



J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 648-05 (Plastic)

SN54LS20
SN74LS20

DUAL 4-INPUT NAND GATE

LOW POWER SCHOTTKY

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I _{OH} | Output Current — High | 54, 74 | | | -0.4 | mA |
| I _{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------------|---|--------|-------|------|-------|---|
| | | MIN | TYP | MAX | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V _{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V _{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA |
| V _{OH} | Output HIGH Voltage | 54 | 2.5 | 3.5 | V | V _{CC} = MIN, I _{OH} = MAX, V _{IN} = V _{IH} or V _{IL} per Truth Table |
| | | 74 | 2.7 | 3.5 | V | |
| V _{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | I _{OL} = 4.0 mA, V _{CC} = V _{CC} MIN, V _{IN} = V _{IL} or V _{IH} per Truth Table |
| | | 74 | 0.35 | 0.5 | V | I _{OL} = 8.0 mA |
| I _{IH} | Input HIGH Current | | | 20 | μA | V _{CC} = MAX, V _{IN} = 2.7 V |
| I _{IL} | Input LOW Current | | | 0.1 | mA | V _{CC} = MAX, V _{IN} = 7.0 V |
| I _{OS} | Short Circuit Current | -20 | | -100 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| I _{CC} | Power Supply Current Total, Output HIGH Total, Output LOW | | | 0.8 | mA | V _{CC} = MAX |
| | | | | 2.2 | | |

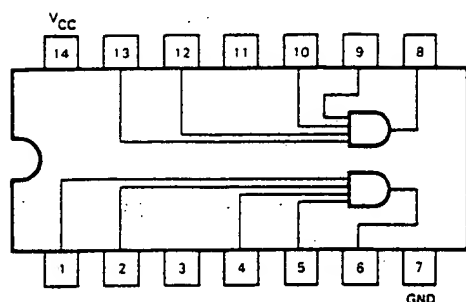
AC CHARACTERISTICS: T_A = 25°C

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------|---------------------------------|--------|-----|-----|-------|---|
| | | MIN | TYP | MAX | | |
| t _{PLH} | Turn Off Delay, Input to Output | | 9.0 | 15 | ns | V _{CC} = 5.0 V C _L = 15 pF |
| t _{PHL} | Turn On Delay, Input to Output | | 10 | 15 | ns | |

MOTOROLA SCHOTTKY TTL DEVICES



MOTOROLA



J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

SN54LS21
SN74LS21

DUAL 4-INPUT AND GATE
LOW POWER SCHOTTKY

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|----------|-------------------------------------|----------|-------------|------------|-------------|------|
| V_{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T_A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I_{OH} | Output Current — High | 54, 74 | | | -0.4 | mA |
| I_{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

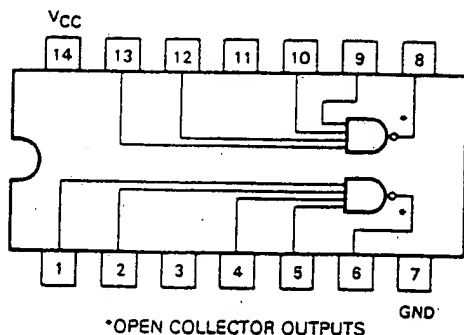
| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|----------|---|--------|-------|------|---------------|---|
| | | MIN | TYP | MAX | | |
| V_{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V_{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V_{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | $V_{CC} = \text{MIN}$, $I_{IN} = -18 \text{ mA}$ |
| V_{OH} | Output HIGH Voltage | 54 | 2.5 | 3.5 | V | $V_{CC} = \text{MIN}$, $I_{OH} = \text{MAX}$, $V_{IN} = V_{IH}$ or V_{IL} per Truth Table |
| | | 74 | 2.7 | 3.5 | V | |
| V_{OL} | Output LOW Voltage | 54, 74 | | 0.25 | V | $I_{OL} = 4.0 \text{ mA}$ $I_{OL} = 8.0 \text{ mA}$ $V_{CC} = V_{CC} \text{ MIN}$, $V_{IN} = V_{IL}$ or V_{IH} per Truth Table |
| | | 74 | | 0.35 | V | |
| I_{IH} | Input HIGH Current | | | 20 | μA | $V_{CC} = \text{MAX}$, $V_{IN} = 2.7 \text{ V}$ |
| | | | | 0.1 | mA | $V_{CC} = \text{MAX}$, $V_{IN} = 7.0 \text{ V}$ |
| I_{IL} | Input LOW Current | | | -0.4 | mA | $V_{CC} = \text{MAX}$, $V_{IN} = 0.4 \text{ V}$ |
| I_{OS} | Short Circuit Current | -20 | | -100 | mA | $V_{CC} = \text{MAX}$ |
| I_{CC} | Power Supply Current Total, Output HIGH Total, Output LOW | | | 2.4 | mA | $V_{CC} = \text{MAX}$ |
| | | | | 4.4 | | |

AC CHARACTERISTICS: $T_A = 25^\circ\text{C}$

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------|---------------------------------|--------|-----|-----|-------|---|
| | | MIN | TYP | MAX | | |
| t_{PLH} | Turn Off Delay, Input to Output | | 8.0 | 15 | ns | $V_{CC} = 5.0 \text{ V}$ $C_L = 15 \text{ pF}$ |
| t_{PHL} | Turn On Delay, Input to Output | | 10 | 20 | ns | |



SN54LS22
SN74LS22



*OPEN COLLECTOR OUTPUTS

J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

DUAL 4-INPUT NAND GATE
LOW POWER SCHOTTKY

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| V _{OH} | Output Voltage — High | 54, 74 | | | 5.5 | V |
| I _{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

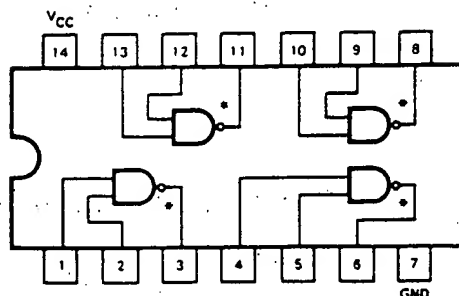
| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------------|---|--------|-------|------|-------|---|
| | | MIN | TYP | MAX | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V _{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V _{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA |
| I _{OH} | Output HIGH Current | 54, 74 | | 100 | μA | V _{CC} = MIN, V _{OH} = MAX |
| V _{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | V _{CC} = V _{CC} MIN, V _{IN} = V _{IL} or V _{IH} per Truth Table |
| | | 74 | 0.35 | 0.5 | V | |
| I _{IH} | Input HIGH Current | | | 20 | μA | V _{CC} = MAX, V _{IN} = 2.7 V |
| | | | | 0.1 | mA | V _{CC} = MAX, V _{IN} = 7.0 V |
| I _{IL} | Input LOW Current | | | -0.4 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| I _{CC} | Power Supply Current Total, Output HIGH Total, Output LOW | | | 0.8 | mA | V _{CC} = MAX |
| | | | | 2.2 | | |

AC CHARACTERISTICS: T_A = 25°C

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------|---------------------------------|--------|-----|-----|-------|--|
| | | MIN | TYP | MAX | | |
| t _{PLH} | Turn Off Delay, Input to Output | | 17 | 32 | ns | V _{CC} = 5.0 V C _L = 15 pF, R _L = 2.0 kΩ |
| t _{PHL} | Turn On Delay, Input to Output | | 15 | 28 | ns | |



MOTOROLA



*OPEN COLLECTOR OUTPUTS

J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

SN54LS26
SN74LS26

QUAD 2-INPUT NAND BUFFER

LOW POWER SCHOTTKY

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| V _{OH} | Output Voltage — High | 54, 74 | | | 15 | V |
| I _{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

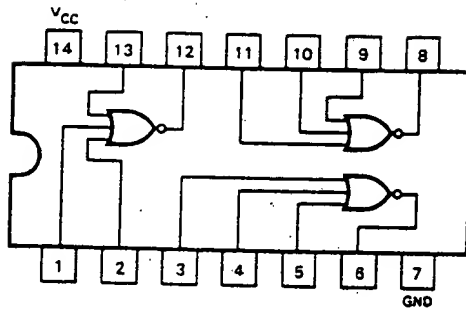
DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------------|---|--------|-------|------|-------|---|
| | | MIN | TYP | MAX | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V _{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V _{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA |
| I _{OH} | Output HIGH Current | 54, 74 | | 1000 | μA | V _{CC} = MIN, V _{OH} = MAX |
| | | 54, 74 | | 50 | μA | V _{CC} = MIN, V _{OH} = 12 V |
| V _{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | I _{OL} = 4.0 mA, V _{CC} = V _{CC} MIN, V _{IN} = V _{IL} or V _{IH} per Truth Table |
| | | 74 | 0.35 | 0.5 | V | I _{OL} = 8.0 mA |
| I _{IH} | Input HIGH Current | | | 20 | μA | V _{CC} = MAX, V _{IN} = 2.4 V |
| | | | | 0.1 | mA | V _{CC} = MAX, V _{IN} = 7.0 V |
| I _{IL} | Input LOW Current | | | -0.4 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| I _{CC} | Power Supply Current Total, Output HIGH Total, Output LOW | | | 1.6 | mA | V _{CC} = MAX |
| | | | | 4.4 | | |

AC CHARACTERISTICS: T_A = 25°C

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------|---------------------------------|--------|-----|-----|-------|--|
| | | MIN | TYP | MAX | | |
| t _{PLH} | Turn Off Delay, Input to Output | | 17 | 32 | ns | V _{CC} = 5.0 V C _L = 15 pF, R _L = 2.0 kΩ |
| t _{PHL} | Turn On Delay, Input to Output | | 15 | 28 | ns | |

MOTOROLA SCHOTTKY TTL DEVICES



J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

SN54LS27 SN74LS27

TRIPLE 3-INPUT NOR GATE
LOW POWER SCHOTTKY

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|----------|-------------------------------------|----------|-------------|------------|-------------|------|
| V_{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T_A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I_{OH} | Output Current — High | 54, 74 | | | -0.4 | mA |
| I_{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

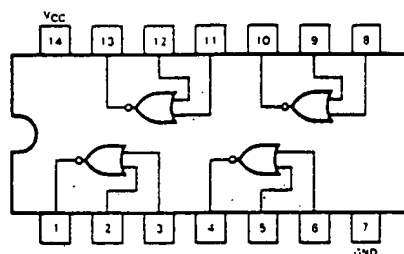
| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|----------|---|--------|-------|------|---------------|---|
| | | MIN | TYP | MAX | | |
| V_{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V_{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V_{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | $V_{CC} = \text{MIN}$, $I_{IN} = -18 \text{ mA}$ |
| V_{OH} | Output HIGH Voltage | 54 | 2.5 | 3.5 | V | $V_{CC} = \text{MIN}$, $I_{OH} = \text{MAX}$, $V_{IN} = V_{IH}$ or V_{IL} per Truth Table |
| | | 74 | 2.7 | 3.5 | V | |
| V_{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | $I_{OL} = 4.0 \text{ mA}$, $V_{CC} = V_{CC} \text{ MIN}$, $V_{IN} = V_{IL}$ or V_{IH} per Truth Table |
| | | 74 | 0.35 | 0.5 | V | $I_{OL} = 8.0 \text{ mA}$ |
| I_{IH} | Input HIGH Current | | | 20 | μA | $V_{CC} = \text{MAX}$, $V_{IN} = 2.7 \text{ V}$ |
| I_{IL} | Input LOW Current | | | 0.1 | mA | $V_{CC} = \text{MAX}$, $V_{IN} = 7.0 \text{ V}$ |
| I_{OS} | Short Circuit Current | -20 | | -100 | mA | $V_{CC} = \text{MAX}$, $V_{IN} = 0.4 \text{ V}$ |
| I_{CC} | Power Supply Current Total, Output HIGH Total, Output LOW | | | 4.0 | mA | $V_{CC} = \text{MAX}$ |
| | | | | 6.8 | | |

AC CHARACTERISTICS: $T_A = 25^\circ\text{C}$

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------|---------------------------------|--------|-----|-----|-------|---|
| | | MIN | TYP | MAX | | |
| t_{PLH} | Turn Off Delay, Input to Output | | 10 | 15 | ns | $V_{CC} = 5.0 \text{ V}$ $C_L = 15 \text{ pF}$ |
| t_{PHL} | Turn On Delay, Input to Output | | 10 | 15 | ns | |



MOTOROLA



J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

SN54LS28
SN74LS28

QUAD 2-INPUT NOR BUFFER

LOW POWER SCHOTTKY

GUARANTEED OPERATING RANGES

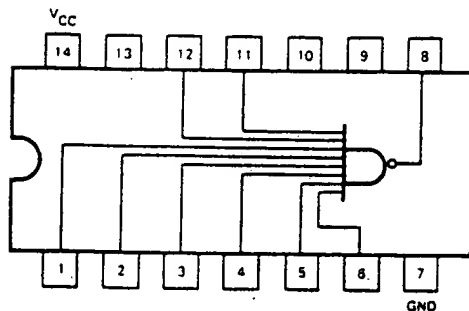
| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I _{OH} | Output Current — High | 54, 74 | | | -1.2 | mA |
| I _{OL} | Output Current — Low | 54 74 | | | 12 24 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------------|---|--------|-------|------|-------|--|
| | | MIN | TYP | MAX | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V _{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V _{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA |
| V _{OH} | Output HIGH Voltage | 54 | 2.5 | 3.5 | V | V _{CC} = MIN, I _{OH} = MAX, V _{IN} = V _{IH} or V _{IL} per Truth Table |
| | | 74 | 2.7 | 3.5 | V | |
| V _{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | V _{CC} = V _{CC} MIN, V _{IN} = V _{IL} or V _{IH} per Truth Table |
| | | 74 | 0.35 | 0.5 | V | |
| I _{IH} | Input HIGH Current | | | 20 | μA | V _{CC} = MAX, V _{IN} = 2.7 V |
| | | | | 0.1 | mA | V _{CC} = MAX, V _{IN} = 7.0 V |
| I _{IL} | Input LOW Current | | | -0.4 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| I _{OS} | Short Circuit Current | -30 | | -130 | mA | V _{CC} = MAX |
| I _{CC} | Power Supply Current Total, Output HIGH Total, Output LOW | | | 3.6 | mA | V _{CC} = MAX |
| | | | | 13.8 | | |

AC CHARACTERISTICS: T_A = 25°C

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------|-------------------|--------|-----|-----|-------|---|
| | | MIN | TYP | MAX | | |
| t _{PLH} | Propagation Delay | | 12 | 24 | ns | V _{CC} = 5.0 V C _L = 45 pF, R _L = 667 Ω |
| t _{PHL} | Propagation Delay | | 12 | 24 | ns | |



J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

SN54LS30
SN74LS30

8-INPUT NAND GATE

LOW POWER SCHOTTKY

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I _{OH} | Output Current — High | 54, 74 | | | -0.4 | mA |
| I _{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

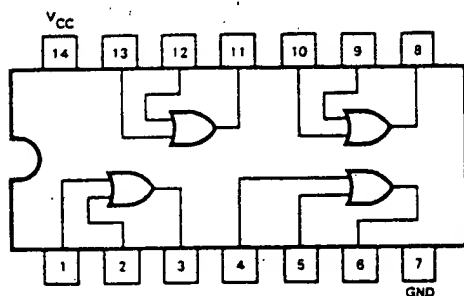
| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------------|---|--------|-------|------|-------|--|
| | | MIN | TYP | MAX | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V _{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V _{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA |
| V _{OH} | Output HIGH Voltage | 54 | 2.5 | 3.5 | V | V _{CC} = MIN, I _{OH} = MAX, V _{IN} = V _{IH} or V _{IL} per Truth Table |
| | | 74 | 2.7 | 3.5 | V | |
| V _{OL} | Output LOW Voltage | 54, 74 | | 0.25 | 0.4 | I _{OL} = 4.0 mA |
| | | 74 | | 0.35 | 0.5 | I _{OL} = 8.0 mA |
| I _{IH} | Input HIGH Current | | | 20 | μA | V _{CC} = MAX, V _{IN} = 2.7 V |
| | | | | 0.1 | mA | V _{CC} = MAX, V _{IN} = 7.0 V |
| I _{IL} | Input LOW Current | | | -0.4 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| I _{OS} | Short Circuit Current | -20 | | -100 | mA | V _{CC} = MAX |
| I _{CC} | Power Supply Current Total, Output HIGH Total, Output LOW | | | 0.5 | mA | V _{CC} = MAX |
| | | | | 1.1 | | |

AC CHARACTERISTICS: T_A = 25°C

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------|---------------------------------|--------|-----|-----|-------|---|
| | | MIN | TYP | MAX | | |
| t _{PLH} | Turn Off Delay, Input to Output | | 8.0 | 15 | ns | V _{CC} = 5.0 V C _L = 15 pF |
| t _{PHL} | Turn On Delay, Input to Output | | 13 | 20 | ns | |



MOTOROLA



J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

SN54LS32
SN74LS32

QUAD 2-INPUT OR GATE
LOW POWER SCHOTTKY

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I _{OH} | Output Current — High | 54, 74 | | | -0.4 | mA |
| I _{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

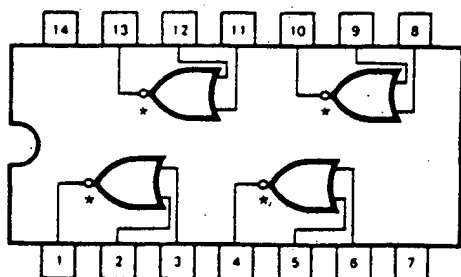
| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------------|---|--------|-------|------|-------|---|
| | | MIN | TYP | MAX | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V _{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V _{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA |
| V _{OH} | Output HIGH Voltage | 54 | 2.5 | 3.5 | V | V _{CC} = MIN, I _{OH} = MAX, V _{IN} = V _{IH} or V _{IL} per Truth Table |
| | | 74 | 2.7 | 3.5 | V | |
| V _{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | I _{OL} = 4.0 mA, V _{CC} = V _{CC} MIN, V _{IN} = V _{IL} or V _{IH} per Truth Table |
| | | 74 | 0.35 | 0.5 | V | I _{OL} = 8.0 mA |
| I _{IH} | Input HIGH Current | | | 20 | μA | V _{CC} = MAX, V _{IN} = 2.7 V |
| | | | | 0.1 | mA | V _{CC} = MAX, V _{IN} = 7.0 V |
| I _{IL} | Input LOW Current | | | -0.4 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| I _{OS} | Short Circuit Current | -20 | | -100 | mA | V _{CC} = MAX |
| I _{CC} | Power Supply Current Total, Output HIGH Total, Output LOW | | | 6.2 | mA | V _{CC} = MAX |
| | | | | 9.8 | | |

AC CHARACTERISTICS: T_A = 25°C

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------|---------------------------------|--------|-----|-----|-------|---|
| | | MIN | TYP | MAX | | |
| t _{PLH} | Turn Off Delay, Input to Output | | 14 | 22 | ns | V _{CC} = 5.0 V C _L = 15 pF |
| t _{PHL} | Turn On Delay, Input to Output | | 14 | 22 | ns | |



MOTOROLA



* OPEN COLLECTOR OUTPUTS

J Suffix — Case 632-07 (Ceramic)

N Suffix — Case 646-05 (Plastic)

SN54LS33
SN74LS33

QUAD 2-INPUT NOR BUFFER

LOW POWER SCHOTTKY

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|----------|-------------------------------------|----------|-------------|------------|-------------|------|
| V_{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T_A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| V_{OH} | Output Voltage — High | 54, 74 | | | 5.5 | V |
| I_{OL} | Output Current — Low | 54 74 | | | 12 24 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

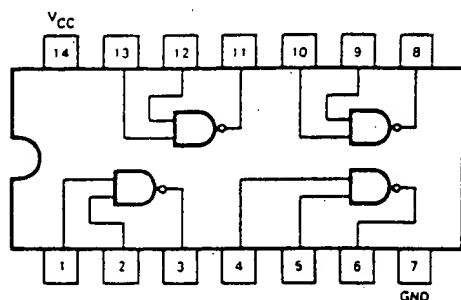
| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|----------|---|--------|-------|------|---------------|--|
| | | MIN | TYP | MAX | | |
| V_{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V_{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V_{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | $V_{CC} = \text{MIN}$, $I_{IN} = -18 \text{ mA}$ |
| I_{OH} | Output HIGH Current | 54, 74 | | 250 | μA | $V_{CC} = \text{MIN}$, $V_{OH} = \text{MAX}$ |
| V_{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | $I_{OL} = 12 \text{ mA}$, $V_{CC} = V_{CC} \text{ MIN}$, $V_{IN} = V_{IL} \text{ or } V_{IH} \text{ per Truth Table}$ |
| | | 74 | 0.35 | 0.5 | V | $I_{OL} = 24 \text{ mA}$ |
| I_{IH} | Input HIGH Current | | | 20 | μA | $V_{CC} = \text{MAX}$, $V_{IN} = 2.7 \text{ V}$ |
| | | | | 0.1 | mA | $V_{CC} = \text{MAX}$, $V_{IN} = 7.0 \text{ V}$ |
| I_{IL} | Input LOW Current | | | -0.4 | mA | $V_{CC} = \text{MAX}$, $V_{IN} = 0.4 \text{ V}$ |
| I_{CC} | Power Supply Current Total, Output HIGH Total, Output LOW | | | 3.6 | mA | $V_{CC} = \text{MAX}$ |
| | | | | 13.8 | | |

AC CHARACTERISTICS: $T_A = 25^\circ\text{C}$

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------|---------------------------------|--------|-----|-----|-------|--|
| | | MIN | TYP | MAX | | |
| t_{PLH} | Turn Off Delay, Input to Output | | 20 | 32 | ns | $V_{CC} = 5.0 \text{ V}$, $R_L = 667 \Omega$ $C_L = 45 \text{ pF}$ |
| t_{PHL} | Turn On Delay, Input to Output | | 18 | 28 | ns | |



MOTOROLA



J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

SN54LS37
SN74LS37

QUAD 2-INPUT NAND BUFFER
LOW POWER SCHOTTKY

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I _{OH} | Output Current — High | 54, 74 | | | -1.2 | mA |
| I _{OL} | Output Current — Low | 54 74 | | | 12 24 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

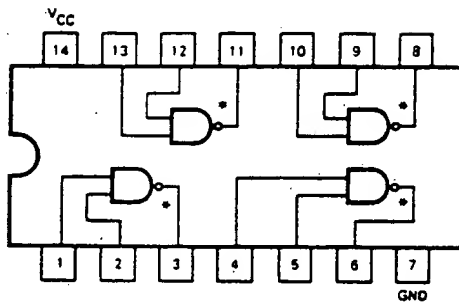
| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------------|---|--------|-------|------|-------|--|
| | | MIN | TYP | MAX | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V _{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V _{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA |
| V _{OH} | Output HIGH Voltage | 54 | 2.5 | 3.5 | V | V _{CC} = MIN, I _{OH} = MAX, V _{IN} = V _{IH} or V _{IL} per Truth Table |
| | | 74 | 2.7 | 3.5 | V | |
| V _{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | I _{OL} = 12 mA, V _{CC} = V _{CC} MIN, V _{IN} = V _{IL} or V _{IH} per Truth Table |
| | | 74 | 0.35 | 0.5 | V | I _{OL} = 24 mA |
| I _{IH} | Input HIGH Current | | | 20 | μA | V _{CC} = MAX, V _{IN} = 2.7 V |
| | | | | 0.1 | mA | V _{CC} = MAX, V _{IN} = 7.0 V |
| I _{IL} | Input LOW Current | | | -0.4 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| I _{OS} | Short Circuit Current | -30 | | -130 | mA | V _{CC} = MAX |
| I _{CC} | Power Supply Current Total, Output HIGH Total, Output LOW | | | 2.0 | mA | V _{CC} = MAX |
| | | | | 12 | | |

AC CHARACTERISTICS: T_A = 25°C

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------|---------------------------------|--------|-----|-----|-------|---|
| | | MIN | TYP | MAX | | |
| t _{PLH} | Turn Off Delay, Input to Output | | 12 | 24 | ns | V _{CC} = 5.0 V, R _L = 667 Ω C _L = 45 pF |
| t _{PHL} | Turn On Delay, Input to Output | | 12 | 24 | ns | |



SN54LS38 **SN74LS38**



*OPEN COLLECTOR OUTPUTS

J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

QUAD 2-INPUT NAND BUFFER
LOW POWER SCHOTTKY

GUARANTEED OPERATING RANGES

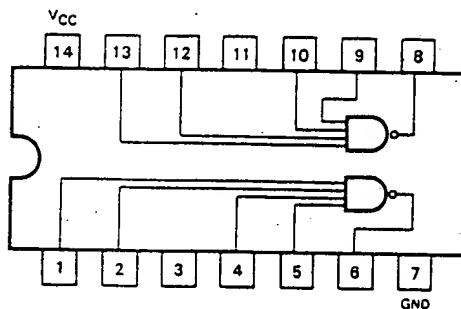
| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|----------|-------------------------------------|----------|-------------|------------|-------------|------|
| V_{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T_A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| V_{OH} | Output Voltage — High | 54, 74 | | | 5.5 | V |
| I_{OL} | Output Current — Low | 54 74 | | | 12 24 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|----------|---|--------|-------|------|---------------|---|
| | | MIN | TYP | MAX | | |
| V_{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V_{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V_{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | $V_{CC} = \text{MIN}$, $I_{IN} = -18 \text{ mA}$ |
| I_{OH} | Output HIGH Current | 54, 74 | | 250 | μA | $V_{CC} = \text{MIN}$, $V_{OH} = \text{MAX}$ |
| V_{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | $I_{OL} = 12 \text{ mA}$, $V_{CC} = V_{CC} \text{ MIN}$, $V_{IN} = V_{IL} \text{ or } V_{IH} \text{ per Truth Table}$ |
| | | 74 | 0.35 | 0.5 | V | $I_{OL} = 24 \text{ mA}$ |
| I_{IH} | Input HIGH Current | | | 20 | μA | $V_{CC} = \text{MAX}$, $V_{IN} = 2.4 \text{ V}$ |
| | | | | 0.1 | mA | $V_{CC} = \text{MAX}$, $V_{IN} = 7.0 \text{ V}$ |
| I_{IL} | Input LOW Current | | | -0.4 | mA | $V_{CC} = \text{MAX}$, $V_{IN} = 0.4 \text{ V}$ |
| I_{CC} | Power Supply Current Total, Output HIGH Total, Output LOW | | | 2.0 | mA | $V_{CC} = \text{MAX}$ |
| | | | | 12 | | |

AC CHARACTERISTICS: $T_A = 25^\circ\text{C}$

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------|---------------------------------|--------|-----|-----|-------|--|
| | | MIN | TYP | MAX | | |
| t_{PLH} | Turn Off Delay, Input to Output | | 20 | 32 | ns | $V_{CC} = 5.0 \text{ V}$, $R_L = 667 \Omega$ $C_L = 45 \text{ pF}$ |
| t_{PHL} | Turn On Delay, Input to Output | | 18 | 28 | ns | |



J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

SN54LS40 **SN74LS40**

DUAL 4-INPUT NAND BUFFER
LOW POWER SCHOTTKY

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I _{OH} | Output Current — High | 54, 74 | | | -1.2 | mA |
| I _{OL} | Output Current — Low | 54 74 | | | 12 24 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------------|---|--------|-------|------|-------|--|
| | | MIN | TYP | MAX | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V _{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V _{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA |
| V _{OH} | Output HIGH Voltage | 54 | 2.5 | 3.5 | V | V _{CC} = MIN, I _{OH} = MAX, V _{IN} = V _{IH} or V _{IL} per Truth Table |
| | | 74 | 2.7 | 3.5 | V | |
| V _{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | I _{OL} = 12 mA, V _{CC} = V _{CC} MIN, V _{IN} = V _{IL} or V _{IH} per Truth Table |
| | | 74 | 0.35 | 0.5 | V | I _{OL} = 24 mA |
| I _{IH} | Input HIGH Current | | | 20 | μA | V _{CC} = MAX, V _{IN} = 2.7 V |
| | | | | 0.1 | mA | V _{CC} = MAX, V _{IN} = 7.0 V |
| I _{IL} | Input LOW Current | | | -0.4 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| I _{OS} | Short Circuit Current | -30 | | -130 | mA | V _{CC} = MAX |
| I _{CC} | Power Supply Current Total, Output HIGH Total, Output LOW | | | 1.0 | mA | V _{CC} = MAX |
| | | | | 6.0 | | |

AC CHARACTERISTICS: T_A = 25°C

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------|---------------------------------|--------|-----|-----|-------|--|
| | | MIN | TYP | MAX | | |
| t _{PLH} | Turn Off Delay, Input to Output | | 12 | 24 | ns | V _{CC} = 5.0 V, R _L = 667 Ω, C _L = 45 pF |
| t _{PHL} | Turn On Delay, Input to Output | | 12 | 24 | ns | |



SN54LS42 SN74LS42

DESCRIPTION — The LSTTL/MSI SN54LS/74LS42 is a Multipurpose Decoder designed to accept four BCD inputs and provide ten mutually exclusive outputs. The LS42 is fabricated with the Schottky barrier diode process for high speed and is completely compatible with all Motorola TTL families.

- MULTI-FUNCTION CAPABILITY
- MUTUALLY EXCLUSIVE OUTPUTS
- DEMULTIPLEXING CAPABILITY
- INPUT CLAMP DIODES LIMIT HIGH SPEED TERMINATION EFFECTS

ONE-OF-TEN DECODER

LOW POWER SCHOTTKY

PIN NAMES

$A_0 - A_3$ Address Inputs
0 to 9 Outputs, Active LOW (Note b)

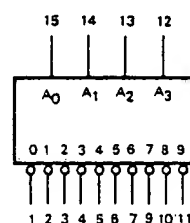
LOADING (Note a)

| HIGH | LOW |
|----------|-------------|
| 0.5 U.L. | 0.25 U.L. |
| 10 U.L. | 5(2.5) U.L. |

NOTES:

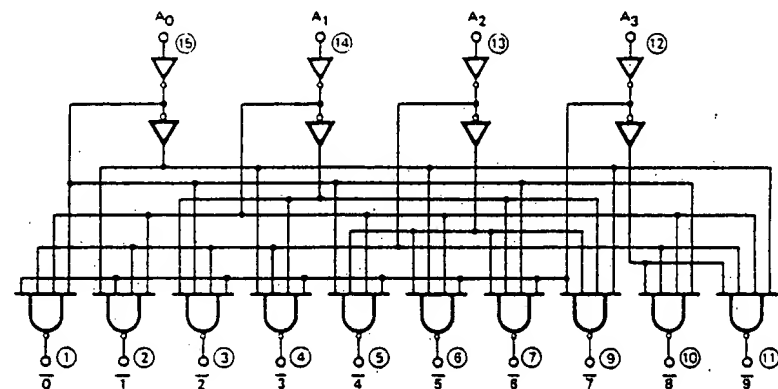
- 1 TTL Unit Load (U.L.) = 40 μ A HIGH/1.6 mA LOW.
- The Output LOW drive factor is 2.5 U.L. for Military (54) and 5 U.L. for Commercial (74) Temperature Ranges.

LOGIC SYMBOL



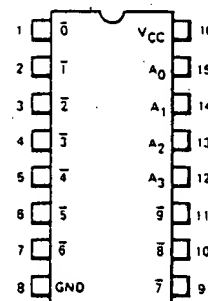
V_{CC} = Pin 16
GND = Pin 8

LOGIC DIAGRAM



V_{CC} = Pin 16
GND = Pin 8
○ = Pin Numbers

CONNECTION DIAGRAM DIP (TOP VIEW)



J Suffix — Case 620-08 (Ceramic)
N Suffix — Case 648-05 (Plastic)

NOTE:
The Flatpak version has the same pinouts (Connection Diagram) as the Dual In-Line Package.

FUNCTIONAL DESCRIPTION — The LS42 decoder accepts four active HIGH BCD inputs and provides ten mutually exclusive active LOW outputs, as shown by logic symbol or diagram. The active LOW outputs facilitate addressing other MSI units with LOW input enables.

The logic design of the LS42 ensures that all outputs are HIGH when binary codes greater than nine are applied to the inputs.

The most significant input A_3 produces a useful inhibit function when the LS42 is used as a one-of-eight decoder. The A_3 input can also be used as the Data input in an 8-output demultiplexer application.

TRUTH TABLE

| A_0 | A_1 | A_2 | A_3 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|-------|-------|-------|-------|---|---|---|---|---|---|---|---|---|---|
| L | L | L | L | L | H | H | H | H | H | H | H | H | H |
| H | L | L | L | H | L | H | H | H | H | H | H | H | H |
| L | H | L | L | H | H | L | H | H | H | H | H | H | H |
| H | H | L | L | H | H | H | L | H | H | H | H | H | H |
| L | L | H | L | H | H | H | H | L | H | H | H | H | H |
| H | L | H | L | H | H | H | H | H | L | H | H | H | H |
| L | H | H | L | H | H | H | H | H | H | L | H | H | H |
| H | H | H | L | H | H | H | H | H | H | H | L | H | H |
| L | L | L | H | H | H | H | H | H | H | H | H | L | H |
| H | L | L | H | H | H | H | H | H | H | H | H | H | L |
| L | H | L | H | H | H | H | H | H | H | H | H | H | H |
| H | H | L | H | H | H | H | H | H | H | H | H | H | H |
| L | L | H | H | H | H | H | H | H | H | H | H | H | H |
| H | L | H | H | H | H | H | H | H | H | H | H | H | H |
| L | H | H | H | H | H | H | H | H | H | H | H | H | H |
| H | H | H | H | H | H | H | H | H | H | H | H | H | H |

H = HIGH Voltage Level
L = LOW Voltage Level

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|----------|-------------------------------------|----------|-------------|------------|-------------|------|
| V_{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T_A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I_{OH} | Output Current — High | 54, 74 | | | -0.4 | mA |
| I_{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|----------|---------------------------|--------|-------|------|---------------|---|
| | | MIN | TYP | MAX | | |
| V_{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V_{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V_{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | $V_{CC} = \text{MIN}$, $I_{IN} = -18 \text{ mA}$ |
| V_{OH} | Output HIGH Voltage | 54 | 2.5 | 3.5 | V | $V_{CC} = \text{MIN}$, $I_{OH} = \text{MAX}$, $V_{IN} = V_{IH}$ or V_{IL} per Truth Table |
| | | 74 | 2.7 | 3.5 | V | |
| V_{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | $V_{CC} = V_{CC} \text{ MIN}$, $V_{IN} = V_{IL}$ or V_{IH} per Truth Table |
| | | 74 | 0.35 | 0.5 | V | |
| I_{IH} | Input HIGH Current | | | 20 | μA | $V_{CC} = \text{MAX}$, $V_{IN} = 2.7 \text{ V}$ |
| | | | | 0.1 | mA | $V_{CC} = \text{MAX}$, $V_{IN} = 7.0 \text{ V}$ |
| I_{IL} | Input LOW Current | | | -0.4 | mA | $V_{CC} = \text{MAX}$, $V_{IN} = 0.4 \text{ V}$ |
| I_{OS} | Short Circuit Current | -20 | | -100 | mA | $V_{CC} = \text{MAX}$ |
| I_{CC} | Power Supply Current | | | 13 | mA | $V_{CC} = \text{MAX}$ |

AC CHARACTERISTICS: $T_A = 25^\circ\text{C}$

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------------|---------------------------------|--------|----------|----------|-------|---|
| | | MIN | TYP | MAX | | |
| t_{PLH} t_{PHL} | Propagation Delay (2 Levels) | | 15 15 | 25 25 | ns | Fig. 2 $V_{CC} = 5.0 \text{ V}$ $C_L = 15 \text{ pF}$ |
| t_{PLH} t_{PHL} | Propagation Delay (3 Levels) | | 20 20 | 30 30 | ns | |

AC WAVEFORMS

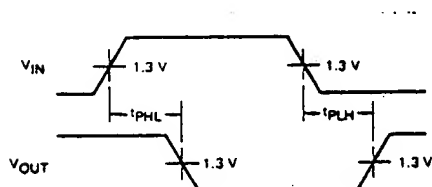


Fig. 1

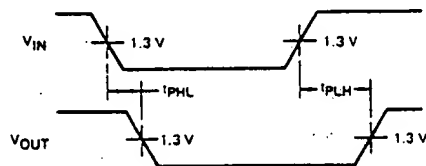


Fig. 2



SN54LS47 SN74LS47

BCD TO 7-SEGMENT DECODER/DRIVER LOW POWER SCHOTTKY

DESCRIPTION — The SN54LS/74LS47 are Low Power Schottky BCD to 7-Segment Decoder/Drivers consisting of NAND gates, input buffers and seven AND-OR-INVERT gates. They offer active LOW, high sink current outputs for driving indicators directly. Seven NAND gates and one driver are connected in pairs to make BCD data and its complement available to the seven decoding AND-OR-INVERT gates. The remaining NAND gate and three input buffers provide lamp test, blanking input/ripple-blanking output and ripple-blanking input.

The circuits accept 4-bit binary-coded-decimal (BCD) and, depending on the state of the auxiliary inputs, decodes this data to drive a 7-segment display indicator. The relative positive-logic output levels, as well as conditions required at the auxiliary inputs, are shown in the truth tables. Output configurations of the SN54LS/74LS47 are designed to withstand the relatively high voltages required for 7-segment indicators.

These outputs will withstand 15 V with a maximum reverse current of 250 μ A. Indicator segments requiring up to 24 mA of current may be driven directly from the SN74LS47 high performance output transistors. Display patterns for BCD input counts above nine are unique symbols to authenticate input conditions.

The SN54LS/74LS47 incorporates automatic leading and/or trailing-edge zero-blanking control (RBI and RBO). Lamp test (LT) may be performed at any time which the BI/RBO node is a HIGH level. This device also contains an overriding blanking input (BI) which can be used to control the lamp intensity or to inhibit the outputs.

- LAMP INTENSITY MODULATION CAPABILITY
- OPEN COLLECTOR OUTPUTS
- LAMP TEST PROVISION
- LEADING/TRAILING ZERO SUPPRESSION
- INPUT CLAMP DIODES LIMIT HIGH-SPEED TERMINATION EFFECTS

PIN NAMES

| | |
|--------------------------|------------------------|
| A, B, C, D | BCD Inputs |
| RBI | Ripple Blanking Input |
| LT | Lamp Test Input |
| BI/RBO | Blanking Input or |
| | Ripple Blanking Output |
| \bar{a} , to \bar{g} | Outputs |

LOADING (Note a)

| | HIGH | LOW |
|--------------------------|----------|---------------|
| A, B, C, D | 0.5 U.L. | 0.25 U.L. |
| RBI | 0.5 U.L. | 0.25 U.L. |
| LT | 0.5 U.L. | 0.25 U.L. |
| BI/RBO | 0.5 U.L. | 0.75 U.L. |
| \bar{a} , to \bar{g} | 1.2 U.L. | 2.0 U.L. |
| Open-Collector | | 15 (7.5) U.L. |

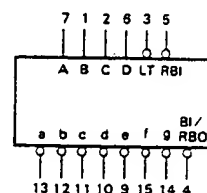
Notes:

a) 1 Unit Load (U.L.) = 40 μ A HIGH, 1.6 mA LOW

b) Output current measured at $V_{OUT} = 0.5$ V

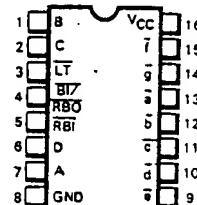
Output LOW drive factor is 7.5 U.L. for Military (54) and 15 U.L. for Commercial (74).
Temperature Ranges.

LOGIC SYMBOL



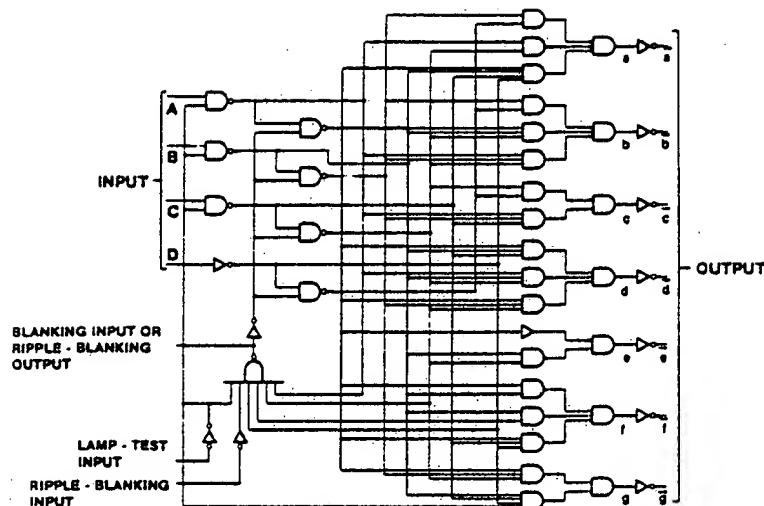
V_{CC} = Pin 16
GND = Pin 8

CONNECTION DIAGRAM DIP (TOP VIEW)



J Suffix — Case 620-08 (Ceramic)
N Suffix — Case 648-05 (Plastic)

LOGIC DIAGRAM



NUMERICAL DESIGNATIONS - RESULTANT DISPLAYS

TRUTH TABLE

| DECIMAL OR FUNCTION | INPUTS | | | | | | | OUTPUTS | | | | | | | | | | NOTE |
|---------------------------|-----------------|------------------|----------------|----------------|----------------|----------------|--------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|------|
| | \overline{LT} | \overline{RBI} | \overline{O} | \overline{C} | \overline{B} | \overline{A} | $\overline{BI}/\overline{RBO}$ | \overline{a} | \overline{b} | \overline{c} | \overline{d} | \overline{e} | \overline{f} | \overline{g} | \overline{h} | \overline{i} | \overline{j} | |
| 0 | H | H | L | L | L | L | H | L | L | L | L | L | L | H | | | | A |
| 1 | H | X | L | L | L | H | H | H | L | L | H | H | H | H | | | | A |
| 2 | H | X | L | L | H | L | H | L | L | H | L | L | H | L | | | | |
| 3 | H | X | L | L | H | H | H | L | L | L | L | H | H | L | | | | |
| 4 | H | X | L | H | L | L | H | H | L | L | H | H | L | L | | | | |
| 5 | H | X | L | H | L | H | H | L | H | L | L | H | L | L | | | | |
| 6 | H | X | L | H | H | L | H | H | H | L | L | L | L | L | | | | |
| 7 | H | X | L | H | H | H | H | L | L | L | H | H | H | H | | | | |
| 8 | H | X | H | L | L | L | H | L | L | L | L | L | L | L | | | | |
| 9 | H | X | H | L | L | H | H | L | L | L | H | H | L | L | | | | |
| 10 | H | X | H | L | H | L | H | H | H | H | L | L | H | L | | | | |
| 11 | H | X | H | L | H | H | H | H | H | L | L | H | H | L | | | | |
| 12 | H | X | H | H | L | L | H | H | L | H | H | H | H | L | | | | |
| 13 | H | X | H | H | L | H | H | L | H | H | L | H | L | L | | | | |
| 14 | H | X | H | H | H | L | H | H | H | H | L | L | L | L | | | | |
| 15 | H | X | H | H | H | H | H | H | H | H | H | H | H | H | | | | |
| \overline{BI} | X | X | X | X | X | X | L | H | H | H | H | H | H | H | | | | B |
| \overline{RBI} | H | L | L | L | L | L | L | H | H | H | H | H | H | H | | | | C |
| \overline{LT} | L | X | X | X | X | X | H | L | L | L | L | L | L | L | | | | D |

H = HIGH Voltage Level

L = LOW Voltage Level

X = Immaterial

NOTES:

- (A) $\overline{BI}/\overline{RBO}$ is wire-AND logic serving as blanking input (\overline{BI}) and/or ripple-blanking output (\overline{RBO}). The blanking out (\overline{BI}) must be open or held at a HIGH level when output functions 0 through 15 are desired, and ripple-blanking input (\overline{RBI}) must be open or at a HIGH level if blanking of a decimal 0 is not desired. X = input may be HIGH or LOW.
- (B) When a LOW level is applied to the blanking input (forced condition) all segment outputs go to a LOW level regardless of the state of any other input condition.
- (C) When ripple-blanking input (\overline{RBI}) and inputs A, B, C, and D are at LOW level, with the lamp test input at HIGH level, all segment outputs go to a HIGH level and the ripple-blanking output (\overline{RBO}) goes to a LOW level (response condition).
- (D) When the blanking input/ripple-blanking output ($\overline{BI}/\overline{RBO}$) is open or held at a HIGH level, and a LOW level is applied to lamp test input, all segment outputs go to a LOW level.

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-------------|--|----------|-------------|------------|-------------|---------|
| V_{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T_A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I_{OH} | Output Current — High $\overline{BI}/\overline{RBO}$ | 54,74 | | | -50 | μA |
| I_{OL} | Output Current — Low $\overline{BI}/\overline{RBO}$ $\overline{BI}/\overline{RBO}$ | 54 74 | | | 1.6 3.2 | mA |
| V_O (off) | Off-State Output Voltage \overline{a} to \overline{g} | 54,74 | | | 15 | V |
| I_O (on) | On-State Output Current \overline{a} to \overline{g} \overline{a} to \overline{g} | 54 74 | | | 12 24 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (Unless otherwise specified)

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|---------------------------------------|---|----------|-------|--------------|---------|---|
| | | MIN | TYP | MAX | | |
| V_{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Threshold Voltage for All Inputs |
| V_{IL} | Input LOW Voltage | 54 74 | | 0.7 0.8 | V | Guaranteed Input LOW Threshold Voltage for All Inputs |
| V_{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | $V_{CC} = \text{MIN}$, $I_{IN} = -18 \text{ mA}$ |
| V_{OH} | Output HIGH Voltage, $\overline{BI}/\overline{RBO}$ | 2.4 | 4.2 | | V | $V_{CC} = \text{MIN}$, $I_{OH} = -50 \mu A$, $V_{IN} = V_{IN}$ or V_{IL} per Truth Table |
| V_{OL} | Output LOW Voltage | 54,74 | 0.25 | 0.4 | V | $I_{OL} = 1.6 \text{ mA}$, $V_{CC} = \text{MIN}$, $V_{IN} = V_{IN}$ |
| | $\overline{BI}/\overline{RBO}$ | 74 | 0.35 | 0.5 | V | $I_{OL} = 3.2 \text{ MA}$ or V_{IL} per Truth Table |
| I_O (off) | Off-State Output Current \overline{a} thru \overline{g} | | | 250 | μA | $V_{CC} = \text{MAX}$, $V_{IN} = V_{IN}$ or V_{IL} per Truth Table, V_O (off) = 15 V |
| V_O (on) | On-State Output Voltage | 54,74 | 0.25 | 0.4 | V | $I_{O(on)} = 12 \text{ mA}$, $V_{CC} = \text{MAX}$, $V_{IN} = V_{IH}$ |
| | \overline{a} thru \overline{g} | 74 | 0.35 | 0.5 | V | $I_{O(on)} = 24 \text{ MA}$ or V_{IL} per Truth Table |
| I_{IH} | Input HIGH Current | | | 20 | μA | $V_{CC} = \text{MAX}$, $V_{IN} = 2.7 \text{ V}$ |
| | | | | 0.1 | mA | $V_{CC} = \text{MAX}$, $V_{IN} = 7.0 \text{ V}$ |
| I_{IL} | Input LOW Current $\overline{BI}/\overline{RBO}$ Any Input except $\overline{BI}/\overline{RBO}$ | | | -1.2 -0.4 | mA | $V_{CC} = \text{MAX}$, $V_{IN} = 0.4 \text{ V}$ |
| $I_{OS} \overline{BI}/\overline{RBO}$ | Output Short Circuit Current | -0.3 | | -2.0 | mA | $V_{CC} = \text{MAX}$, $V_{OUT} = 0 \text{ V}$ |
| I_{CC} | Power Supply Current | | 7.0 | 13 | mA | $V_{CC} = \text{MAX}$ |

AC CHARACTERISTICS: $T_A = 25^\circ\text{C}$

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------|---|--------|-----|-----|-------|---|
| | | MIN | TYP | MAX | | |
| t_{PHL} | Propagation Delay, Address | | | 100 | ns | $V_{CC} = 5.0 \text{ V}$ $C_L = 15 \text{ pF}$ |
| t_{PLH} | Input to Segment Output | | | 100 | ns | |
| t_{PHL} | Propagation Delay, \overline{RBI} Input | | | 100 | ns | |
| t_{PLH} | To Segment Output | | | 100 | ns | |

AC WAVEFORMS

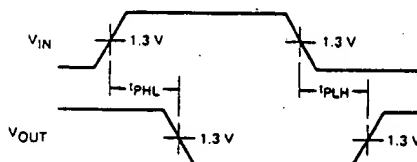


Fig. 1

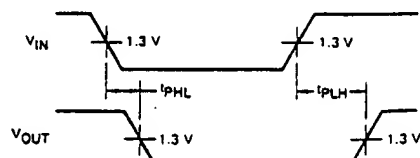


Fig. 2



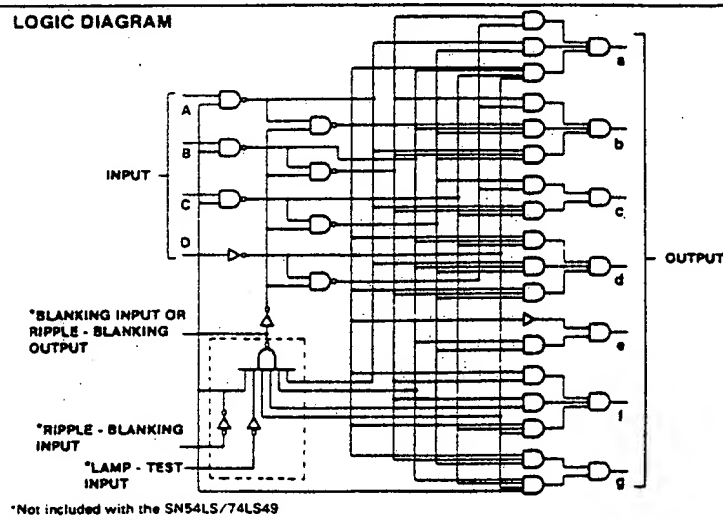
MOTOROLA

DESCRIPTION — The SN54LS/74LS48 and SN54LS/74LS49 are BCD to 7-Segment Decoders consisting of NAND gates, input buffers and seven AND-OR-INVERT gates. The LS49 offers active HIGH open-collector outputs for current-sourcing applications to drive logic circuits or discrete, active components. Seven NAND gates and one driver are connected in pairs to make BCD data and its complement available to the seven decoding AND-OR-INVERT gates. The remaining NAND gate and three input buffers provide lamp test, blanking input/ripple-blanking input for the LS48. Four NAND gates and four input buffers provide BCD data and its complement and a buffer provides blanking input for the LS49.

The circuits accept 4-bit binary-coded-decimal (BCD) and, depending on the state of the auxiliary inputs, decodes this data to drive other components. The relative positive logic output levels, as well as conditions required at the auxiliary inputs, are shown in the truth tables.

The LS48 circuit incorporates automatic leading and/or trailing edge zero-blanking control (RBI and RBO). Lamp Test (LT) may be activated any time when the BI/RBO node is HIGH. Both devices contain an overriding blanking input (BI) which can be used to control the lamp intensity or to inhibit the outputs.

- LAMP INTENSITY MODULATION CAPABILITY
- INTERNAL PULL-UPS ELIMINATE NEED FOR EXTERNAL RESISTORS ON SN54LS/74LS48
- OPEN COLLECTOR OUTPUTS ON SN54LS/74LS49
- INPUT CLAMP DIODES ELIMINATE HIGH-SPEED TERMINATION EFFECTS

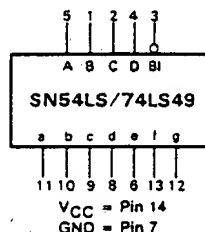
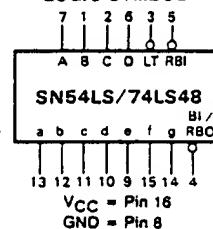


SN54LS/74LS48 SN54LS/74LS49

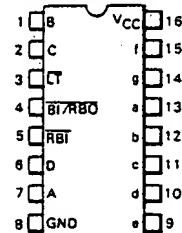
BCD TO 7-SEGMENT DECODER

LOW POWER SCHOTTKY

LOGIC SYMBOL

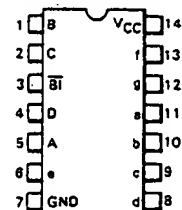


DIP (TOP VIEW) SN54LS/74LS48



J Suffix — Case 620-08 (Ceramic)
N Suffix — Case 648-05 (Plastic)

SN54LS/74LS49



J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

PIN NAMES

| | |
|--------------------------------|---|
| A, B, C, D, | BCD Inputs |
| \overline{RBI} | Ripple Blanking (Active Low) Input |
| \overline{LT} | Lamp Test (Active Low) Input |
| $\overline{BI}/\overline{RBO}$ | Blanking Input or Ripple Blanking Output (Active Low) |
| \overline{BI} | Blanking (Active Low) Input |
| a to g | Outputs (Note b) |

LOADING (Note a)

| HIGH | LOW |
|----------------|-----------------------|
| 0.5 U.L. | 0.25 U.L. |
| 0.5 U.L. | 0.25 U.L. |
| 0.5 U.L. | 0.25 U.L. |
| 0.5 U.L. | 0.75 U.L. |
| 1.2 U.L. | 2(1) U.L. |
| 0.5 U.L. | 0.25 U.L. |
| Open Collector | 3.75 (1.25) U.L. (48) |
| Open Collector | 5 (2.5) U.L. (49) |

NOTES:

a) Unit Load (U.L.) = 40 μ A HIGH/1.6 mA LOWb) Output current measured at $V_{OUT} = 0.5$ VOutput LOW drive factor is SN54LS/74LS48: 1.25 U.L. for Military (54), 3.75 U.L. for Commercial (74).
SN54LS/74LS49: 2.5 U.L. for Military (54), 5 U.L. for Commercial (74) Temperature Ranges.

NUMERICAL DESIGNATIONS - RESULTANT DISPLAYS

TRUTH TABLE
SN54LS/74LS48

| DECIMAL OR FUNCTION | INPUTS | | | | | | | OUTPUTS | | | | | | | NOTE |
|---------------------------|--------|-----|---|---|---|---|--------|---------|---|---|---|---|---|---|------|
| | LT | RBI | D | C | B | A | BI/RBO | a | b | c | d | e | f | | |
| 0 | H | H | L | L | L | L | H | H | H | H | H | H | L | 1 | |
| 1 | H | X | L | L | L | H | H | L | H | L | L | L | L | 1 | |
| 2 | H | X | L | L | H | L | H | H | H | L | H | L | L | H | |
| 3 | H | X | L | L | H | H | H | H | H | H | L | L | L | H | |
| 4 | H | X | L | H | L | L | H | L | H | H | L | L | H | H | |
| 5 | H | X | L | H | L | H | H | H | L | H | H | L | H | H | |
| 6 | H | X | L | H | H | L | H | L | L | H | H | H | H | H | |
| 7 | H | X | L | H | H | H | H | H | H | H | L | L | L | L | |
| 8 | H | X | H | L | L | L | H | H | H | H | H | H | H | H | |
| 9 | H | X | H | L | L | H | H | H | H | H | L | L | H | H | |
| 10 | H | X | H | L | H | L | H | L | L | L | H | H | L | H | |
| 11 | H | X | H | L | H | H | H | L | L | H | H | L | L | H | |
| 12 | H | X | H | H | L | L | H | L | H | L | L | L | H | H | |
| 13 | H | X | H | H | L | H | H | H | L | L | L | H | L | H | |
| 14 | H | X | H | H | H | L | H | L | L | L | H | H | H | H | |
| 15 | H | X | H | H | H | H | H | L | L | L | L | L | L | L | |
| RBI | X | X | X | X | X | X | L | L | L | L | L | L | L | 2 | |
| LT | L | L | L | L | L | L | L | L | L | L | L | L | L | 3 | |
| LT | L | X | X | X | X | X | H | H | H | H | H | H | H | 4 | |

TRUTH TABLE
SN54LS/74LS49

| DECIMAL OR FUNCTION | INPUTS | | | | | OUTPUTS | | | | | | | NOTE |
|---------------------------|--------|---|---|---|-----------------|---------|---|---|---|---|---|---|------|
| | D | C | B | A | \overline{BI} | a | b | c | d | e | f | g | |
| 0 | L | L | L | L | H | H | H | H | H | H | L | L | 1 |
| 1 | L | L | L | H | H | L | H | L | L | L | L | L | 1 |
| 2 | L | L | H | L | H | H | L | H | L | L | L | L | H |
| 3 | L | L | H | H | H | H | L | H | L | L | L | L | H |
| 4 | L | H | L | L | H | H | L | H | L | L | L | L | H |
| 5 | L | H | L | H | H | H | L | H | L | L | L | L | H |
| 6 | L | H | H | L | H | L | L | H | H | L | L | L | H |
| 7 | L | H | H | H | H | H | L | L | L | L | L | L | L |
| 8 | H | L | L | L | H | H | H | H | H | H | H | H | H |
| 9 | H | L | L | H | H | H | H | L | L | L | L | L | H |
| 10 | H | L | H | L | H | L | L | L | L | H | L | L | H |
| 11 | H | L | H | H | H | L | L | L | L | H | L | L | H |
| 12 | H | H | L | L | H | L | L | L | L | L | L | L | H |
| 13 | H | H | L | H | H | L | L | L | L | L | L | L | H |
| 14 | H | H | H | L | H | L | L | L | L | L | L | L | H |
| 15 | H | H | H | H | H | L | L | L | L | L | L | L | L |
| \overline{BI} | X | X | X | X | L | L | L | L | L | L | L | L | 2 |

NOTES:

- (1) $\overline{BI}/\overline{RBO}$ is wired-AND logic serving as blanking input (\overline{BI}) and/or ripple-blanking output (\overline{RBO}). The blanking out (\overline{BI}) must be open or held at a HIGH level when output functions 0 through 15 are desired, and ripple-blanking input (\overline{RBI}) must be open or at a HIGH level if blanking of a decimal 0 is not desired. X=input may be HIGH or LOW.
- (2) When a LOW level is applied to the blanking input (forced condition) all segment outputs go to a LOW level, regardless of the state of any other input condition.
- (3) When ripple-blanking input (\overline{RBI}) and inputs A, B, C, and D are at LOW level, with the lamp test input at HIGH level, all segment outputs go to a HIGH level and the ripple-blanking output (\overline{RBO}) goes to a LOW level (response condition).
- (4) When the blanking input/ripple-blanking output ($\overline{BI}/\overline{RBO}$) is open or held at a HIGH level, and a LOW level is applied to lamp-test input, all segment outputs go to a LOW level.

NOTES:

- (1) The blanking input must be open or held at a HIGH level when output functions 0 through 15 are desired.
- (2) When a LOW level is applied to the blanking input all segment outputs go to a LOW level regardless of the state of any other input condition. X = input may be HIGH or LOW.

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|---|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I _{OH} | Output Current — High \bar{a} to \bar{g} | 54, 74 | | | -100 | μA |
| I _{OH} | Output Current — High \bar{BI}/\bar{RBO} | 54, 74 | | | -50 | μA |
| I _{OL} | Output Current — Low \bar{a} to \bar{g} | 54 74 | | | 2.0 6.0 | mA |
| I _{OL} | Output Current — Low \bar{BI}/\bar{RBO} \bar{BI}/\bar{RBO} | 54 74 | | | 1.6 3.2 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------------|---|----------|------|------------|-------|--|
| | | MIN | TYP | MAX | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V _{IL} | Input LOW Voltage | 54 74 | | 0.7 0.8 | V | Guaranteed Input LOW Voltage for All Inputs |
| V _{IK} | Input Clamp Diode Voltage | | | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA |
| V _{OH} | Output HIGH Voltage | 2.4 | 4.2 | | μA | V _{CC} = MIN, I _{OH} = -50 μA, V _{IN} = V _{IH} or U.L. per Truth Table |
| I _O | Output Current \bar{a} to \bar{g} | -2.0 | -1.3 | | mA | V _{CC} = MIN, V _O = 0.85 V Input Conditioner as for V _{OH} |
| V _{OL} | Output LOW Voltage \bar{a} to \bar{g} | 54, 74 | | 0.4 | V | I _{OL} = 2.0 mA V _{CC} = MIN, V _{IH} = 2.0 V |
| | | 74 | | 0.5 | V | I _{OL} = 6.0 mA V _{IL} = V _{IL} MAX |
| V _{OL} | Output LOW Voltage \bar{BI}/\bar{RBO} | 54, 74 | | 0.4 | V | I _{OL} = 1.6 mA V _{CC} = MAX, V _{IH} = 2.0 V |
| | | 74 | | 0.5 | V | I _{OL} = 3.2 mA V _{IL} = V _{IL} MAX |
| I _{IH} | Input HIGH Current (Except \bar{BI}/\bar{RBO}) | | | 20 | μA | V _{CC} = MAX, V _{IN} = 2.7 V |
| | | | | 0.1 | mA | V _{CC} = MAX, V _{IN} = 7.0 V |
| I _{IL} | Input LOW Current (Except \bar{BI}/\bar{RBO}) | | | -0.4 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| I _{IL} | Input LOW Current \bar{BI}/\bar{RBO} | | | -1.2 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| I _{CC} | Power Supply Current | | 25 | 38 | mA | V _{CC} = MAX |

AC CHARACTERISTICS: V_{CC} = 5.0 V T_A = 25°C

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------|---|--------|-----|-----|-------|---|
| | | MIN | TYP | MAX | | |
| t _{PHL} | Propagation delay time, HIGH-to-LOW level output from A Input | | | 100 | ns | C _L = 15 pF, R _L = 4.0 kΩ |
| t _{PLH} | Propagation delay time, LOW-to-HIGH level output from A Input | | | 100 | ns | |
| t _{PHL} | Propagation delay time, HIGH-to-LOW level output from \bar{RBI} Input | | | 100 | ns | C _L = 15 pF, R _L = 6.0 kΩ |
| t _{PLH} | Propagation delay time, LOW-to-HIGH level output from \bar{RBI} Input | | | 100 | ns | |

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| V _{OH} | Output Voltage — High | 54, 74 | | | 5.5 | V |
| I _{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

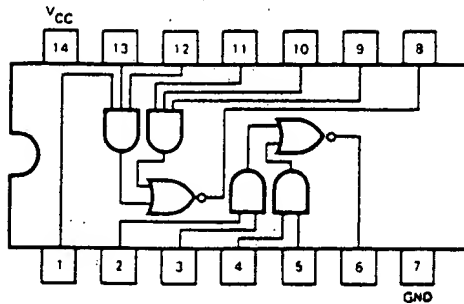
| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------------|---------------------------|--------|-----|------|-------|--|
| | | MIN | TYP | MAX | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage |
| V _{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guarantee Input LOW Voltage |
| | | 74 | | 0.8 | V | |
| V _{IK} | Input Clamp Diode Voltage | | | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA |
| I _{OH} | Output HIGH Current | | | 250 | μA | V _{CC} = MIN, V _{IH} = 2.0 V V _{IL} = V _{IL} MAX, V _{OH} = 5.5 V |
| V _{OL} | Output LOW Voltage | 54, 74 | | 0.4 | V | I _{OL} = 4.0 mA |
| | | 74 | | 0.5 | V | I _{OL} = 8.0 mA |
| I _{IH} | Input Current HIGH | | | 20 | μA | V _{CC} = MAX, V _{IN} = 2.7 V |
| I _{IL} | Input Current LOW | | | 0.1 | mA | V _{CC} = MAX, V _{IN} = 7.0 V |
| I _{CC} | Power Supply Current | | 8.0 | 15 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| | | | | | | V _{CC} = MAX |

AC CHARACTERISTICS: V_{CC} = 5.0 V, T_A = 25°

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------|--|--------|-----|-----|-------|---|
| | | MIN | TYP | MAX | | |
| t _{PHL} | Propagation delay time, HIGH-to-LOW level output from A Input | | | 100 | ns | C _L = 15 pF, R _L = 2.0 kΩ |
| t _{PLH} | Propagation delay time, LOW-to-HIGH level output from A Input | | | 100 | ns | |
| t _{PHL} | Propagation delay time, HIGH-to-LOW level output from \overline{RBI} Input | | | 100 | ns | C _L = 15 pF, R _L = 6.0 kΩ |
| t _{PLH} | Propagation delay time, LOW-to-HIGH level output from \overline{RBI} Input | | | 100 | ns | |



MOTOROLA



J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

**SN54LS51
SN74LS51**

**DUAL 2-WIDE 2-INPUT/
3-INPUT AND-OR-INVERT GATE**
LOW POWER SCHOTTKY

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I _{OH} | Output Current — High | 54, 74 | | | -0.4 | mA |
| I _{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

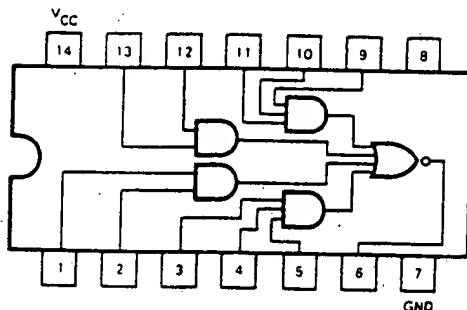
DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------------|---|--------|-------|------|-------|---|
| | | MIN | TYP | MAX | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V _{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V _{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA |
| V _{OH} | Output HIGH Voltage | 54 | 2.5 | 3.5 | V | V _{CC} = MIN, I _{OH} = MAX, V _{IN} = V _{IH} or V _{IL} per Truth Table |
| | | 74 | 2.7 | 3.5 | V | |
| V _{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | I _{OL} = 4.0 mA, V _{CC} = V _{CC} MIN, V _{IN} = V _{IL} or V _{IH} per Truth Table |
| | | 74 | 0.35 | 0.5 | V | I _{OL} = 8.0 mA |
| I _{IH} | Input HIGH Current | | | 20 | μA | V _{CC} = MAX, V _{IN} = 2.7 V |
| I _{IL} | | | | 0.1 | mA | V _{CC} = MAX, V _{IN} = 7.0 V |
| I _{IL} | Input LOW Current | | | -0.4 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| I _{OS} | Short Circuit Current | -20 | | -100 | mA | V _{CC} = MAX |
| I _{CC} | Power Supply Current Total, Output HIGH Total, Output LOW | | | 1.6 | mA | V _{CC} = MAX |
| | | | | 2.8 | | |

AC CHARACTERISTICS: T_A = 25°C

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------|---------------------------------|--------|------|-----|-------|---|
| | | MIN | TYP | MAX | | |
| t _{PLH} | Turn Off Delay, Input to Output | | 12 | 20 | ns | V _{CC} = 5.0 V C _L = 15 pF |
| t _{PHL} | Turn On Delay, Input to Output | | 12.5 | 20 | ns | |

MOTOROLA SCHOTTKY TTL DEVICES



J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

SN54LS54
SN74LS54

3-2-2-3-INPUT
AND-OR-INVERT GATE
LOW POWER SCHOTTKY

GUARANTEED OPERATING RANGES

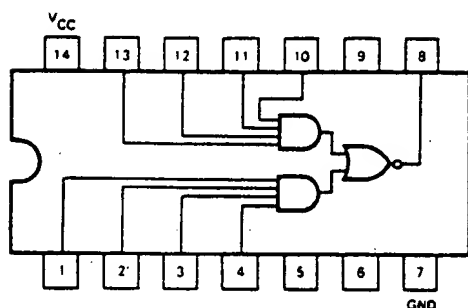
| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I _{OH} | Output Current — High | 54, 74 | | | -0.4 | mA |
| I _{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------------|---|--------|-------|------|-------|---|
| | | MIN | TYP | MAX | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V _{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V _{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA |
| V _{OH} | Output HIGH Voltage | 54 | 2.5 | 3.5 | V | V _{CC} = MIN, I _{OH} = MAX, V _{IN} = V _{IH} or V _{IL} per Truth Table |
| | | 74 | 2.7 | 3.5 | V | |
| V _{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | I _{OL} = 4.0 mA, V _{CC} = V _{CC} MIN, V _{IN} = V _{IL} or V _{IH} per Truth Table |
| | | 74 | 0.35 | 0.5 | V | I _{OL} = 8.0 mA |
| I _{IH} | Input HIGH Current | | | 20 | μA | V _{CC} = MAX, V _{IN} = 2.7 V |
| I _{IL} | Input LOW Current | | | 0.1 | mA | V _{CC} = MAX, V _{IN} = 7.0 V |
| I _{OS} | Short Circuit Current | -20 | | -100 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| I _{CC} | Power Supply Current Total, Output HIGH Total, Output LOW | | | 1.6 | mA | V _{CC} = MAX |
| | | | | 2.0 | | |

AC CHARACTERISTICS: T_A = 25°C

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------|---------------------------------|--------|------|-----|-------|---|
| | | MIN | TYP | MAX | | |
| t _{PLH} | Turn Off Delay, Input to Output | | 12 | 20 | ns | V _{CC} = 5.0 V C _L = 15 pF |
| t _{PHL} | Turn On Delay, Input to Output | | 12.5 | 20 | ns | |



J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

SN54LS55 SN74LS55

2-WIDE 4-INPUT
AND - OR - INVERT GATE
LOW POWER SCHOTTKY

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP. | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I _{OH} | Output Current — High | 54, 74 | | | -0.4 | mA |
| I _{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------------|---|--------|-------|------|-------|--|
| | | MIN | TYP | MAX | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V _{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V _{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA |
| V _{OH} | Output HIGH Voltage | 54 | 2.5 | 3.5 | V | V _{CC} = MIN, I _{OH} = MAX, V _{IN} = V _{IH} or V _{IL} per Truth Table |
| | | 74 | 2.7 | 3.5 | V | |
| V _{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | V _{CC} = V _{CC} MIN, V _{IN} = V _{IL} or V _{IH} per Truth Table |
| | | 74 | 0.35 | 0.5 | V | |
| I _{IH} | Input HIGH Current | | | 20 | μA | V _{CC} = MAX, V _{IN} = 2.7 V |
| | | | | 0.1 | mA | V _{CC} = MAX, V _{IN} = 7.0 V |
| I _{IL} | Input LOW Current | | | -0.4 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| I _{OS} | Short Circuit Current | -20 | | -100 | mA | V _{CC} = MAX |
| I _{CC} | Power Supply Current Total, Output HIGH Total, Output LOW | | | 0.8 | mA | V _{CC} = MAX |
| | | | | 1.3 | | |

AC CHARACTERISTICS: T_A = 25°C

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------|---------------------------------|--------|------|-----|-------|---|
| | | MIN | TYP | MAX | | |
| t _{PLH} | Turn Off Delay, Input to Output | | 12 | 20 | ns | V _{CC} = 5.0 V C _L = 15 pF |
| t _{PHL} | Turn On Delay, Input to Output | | 12.5 | 20 | ns | |



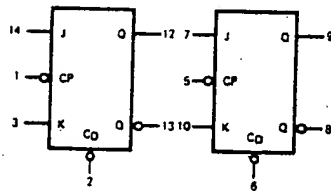
MOTOROLA

SN54LS73A SN74LS73A

DESCRIPTION — The SN54LS/74LS73A offers individual J, K, clear, and clock inputs. These dual flip-flops are designed so that when the clock goes HIGH, the inputs are enabled and data will be accepted. The logic level of the J and K inputs may be allowed to change when the clock pulse is HIGH and the bistable will perform according to the truth table as long as minimum set-up times are observed. Input data is transferred to the outputs on the negative-going edge of the clock pulse.

**DUAL JK NEGATIVE
EDGE-TRIGGERED FLIP-FLOP
LOW POWER SCHOTTKY**

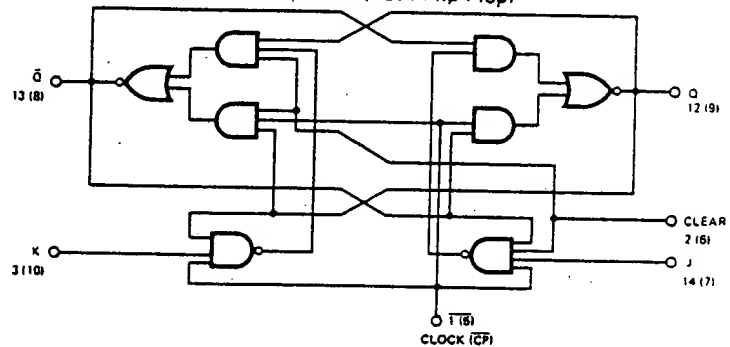
LOGIC SYMBOL



VCC = Pin 4
GND = Pin 11

J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

LOGIC DIAGRAM (Each Flip-Flop)



DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------------|---------------------------|------------------------|-------|-------------------|-------|---|
| | | MIN | TYP | MAX | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V _{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V _{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA |
| V _{OH} | Output HIGH Voltage | 54 | 2.5 | 3.5 | V | V _{CC} = MIN, I _{OH} = MAX, V _{IN} = V _{IH} or V _{IL} per Truth Table |
| | | 74 | 2.7 | 3.5 | V | |
| V _{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | I _{OL} = 4.0 mA, V _{CC} = V _{CC} MIN, V _{IN} = V _{IL} or V _{IH} per Truth Table |
| | | 74 | 0.35 | 0.5 | V | I _{OL} = 8.0 mA |
| I _{IH} | Input HIGH Current | J, K Clear Clock | | 20 60 80 | μA | V _{CC} = MAX, V _{IN} = 2.7 V |
| | | J, K Clear Clock | | 0.1 0.3 0.4 | mA | V _{CC} = MAX, V _{IN} = 7.0 V |
| I _{IL} | Input LOW Current | J, K Clear, Clock | | -0.4 -0.8 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| I _{OS} | Short Circuit Current | | -20 | -100 | mA | V _{CC} = MAX |
| I _{CC} | Power Supply Current | | | 6.0 | mA | V _{CC} = MAX |

MODE SELECT — TRUTH TABLE

| OPERATING MODE | INPUTS | | | OUTPUTS | |
|------------------|------------------|---|---|----------------|----------------|
| | $\overline{C_D}$ | J | K | Q | \overline{Q} |
| Reset (Clear) | L | X | X | L | H |
| Toggle | H | h | h | \overline{q} | q |
| Load "0" (Reset) | H | l | h | L | H |
| Load "1" (Set) | H | h | l | H | L |
| Hold | H | l | l | q | \overline{q} |

H, h = HIGH Voltage Level

L, l = LOW Voltage Level

X = Don't Care

l, h (q) = Lower case letters indicate the state of the referenced input (or output) one set-up time prior to the HIGH to LOW clock transition.

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|--------|------|-----|------|------|
| V _{CC} | Supply Voltage | 54 | 4.5 | 5.0 | 5.5 | V |
| | | 74 | 4.75 | 5.0 | 5.25 | |
| T _A | Operating Ambient Temperature Range | 54 | -55 | 25 | 125 | °C |
| | | 74 | 0 | 25 | 70 | |
| I _{OH} | Output Current — High | 54, 74 | | | -0.4 | mA |
| I _{OL} | Output Current — Low | 54 | | | 4.0 | mA |
| | | 74 | | | 8.0 | |

AC CHARACTERISTICS: T_A = 25°C, V_{CC} = 5.0 V

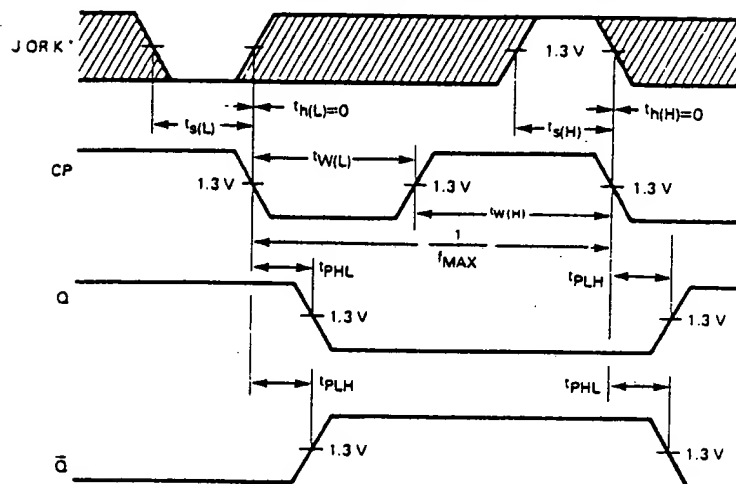
| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS | |
|------------------|-------------------------|--------|-----|-----|-------|-----------------|---|
| | | MIN | TYP | MAX | | | |
| f _{MAX} | Maximum Clock Frequency | 30 | 45 | | MHz | Fig. 1 | V _{CC} = 5.0 V C _L = 15 pF |
| t _{PLH} | Propagation Delay, | | 15 | 20 | ns | Fig. 1 | |
| t _{PHL} | Clock to Output | | 15 | 20 | ns | | |

AC SETUP REQUIREMENTS: T_A = 25°C

| ABSTRACT OF REQUIREMENTS: TA = 25 °C | | | | | | | |
|--------------------------------------|------------------------|--------|-----|-----|-------|-----------------|-------------|
| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS | |
| | | MIN | TYP | MAX | | | |
| tW | Clock Pulse Width High | 20 | | | ns | Fig. 1 | VCC = 5.0 V |
| tW | Set Pulse Width | 25 | | | ns | Fig. 2 | |
| tS | Setup Time | 20 | | | ns | Fig. 1 | |
| tH | Hold Time | 0 | | | ns | | |

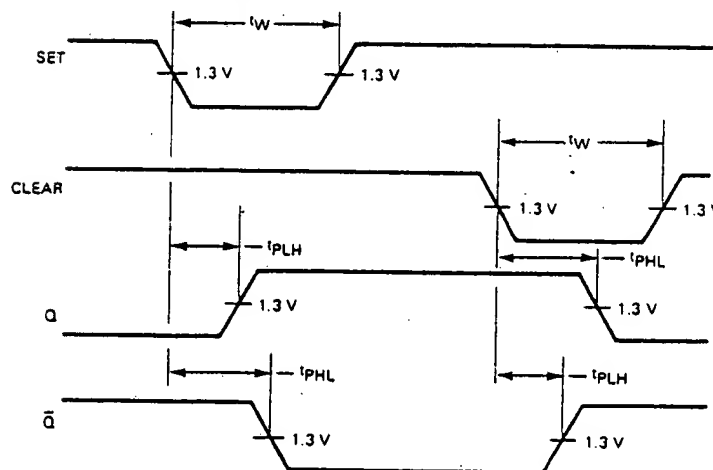
AC WAVEFORMS

Fig. 1 CLOCK TO OUTPUT DELAYS, DATA SET-UP AND HOLD TIMES, CLOCK PULSE WIDTH



*The shaded areas indicate when the input is permitted to change for predictable output performance.

Fig. 2 SET AND CLEAR TO OUTPUT DELAYS, SET AND CLEAR PULSE WIDTHS





SN54LS74A SN54LS74A

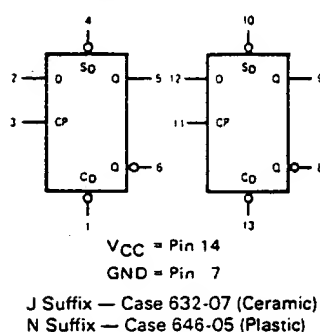
DESCRIPTION - The SN54LS/74LS74A dual edge-triggered flip-flop utilizes Schottky TTL circuitry to produce high speed D-type flip-flops. Each flip-flop has individual clear and set inputs, and also complementary Q and \bar{Q} outputs.

Information at input D is transferred to the Q output on the positive-going edge of the clock pulse. Clock triggering occurs at a voltage level of the clock pulse and is not directly related to the transition time of the positive-going pulse. When the clock input is at either the HIGH or the LOW level, the D input signal has no effect.

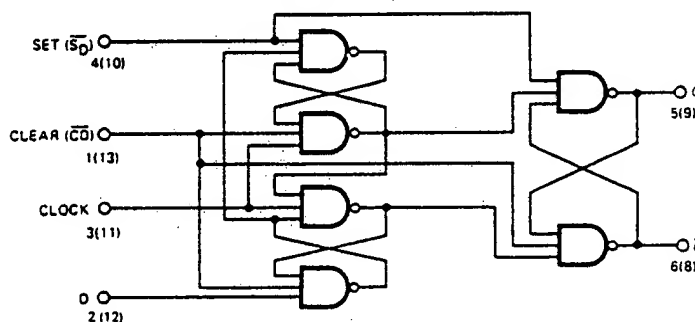
DUAL D-TYPE POSITIVE EDGE-TRIGGERED FLIP-FLOP

LOW POWER SCHOTTKY

LOGIC SYMBOL



LOGIC DIAGRAM
(EACH FLIP-FLOP)



DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------------|---|--------|-------|--------------|-------|--|
| | | MIN | TYP | MAX | | |
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V _{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V _{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA |
| V _{OH} | Output HIGH Voltage | 54 | 2.5 | 3.5 | V | V _{CC} = MIN, I _{OH} = MAX, V _{IN} = V _{IH} or V _{IL} per Truth Table |
| | | 74 | 2.7 | 3.5 | V | |
| V _{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | V _{CC} = V _{CC} MIN, V _{IN} = V _{IL} or V _{IH} per Truth Table |
| | | 74 | 0.35 | 0.5 | V | |
| I _{IH} | Input High Current Data, Clock Set, Clear | | | 20 40 | μA | V _{CC} = MAX, V _{IN} = 2.7 V |
| | Data, Clock Set, Clear | | | 0.1 0.2 | mA | V _{CC} = MAX, V _{IN} = 7.0 V |
| I _{IL} | Input LOW Current Data, Clock Set, Clear | | | -0.4 -0.8 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| I _{OS} | Output Short Circuit Current | -20 | | -100 | mA | V _{CC} = MAX |
| I _{CC} | Power Supply Current | | | 8.0 | mA | V _{CC} = MAX |

MODE SELECT — TRUTH TABLE

| OPERATING MODE | INPUTS | | | OUTPUTS | |
|-------------------|------------------|------------------|---|---------|----------------|
| | $\overline{S_D}$ | $\overline{C_D}$ | D | Q | \overline{Q} |
| Set | L | H | X | H | L |
| Reset (Clear) | H | L | X | L | H |
| *Undetermined | L | L | X | H | H |
| Load "1" (Set) | H | H | h | H | L |
| Load "0" (Reset) | H | H | l | L | H |

*Both outputs will be HIGH while both $\overline{S_D}$ and $\overline{C_D}$ are LOW, but the output states are unpredictable if $\overline{S_D}$ and $\overline{C_D}$ go HIGH simultaneously.

H, h = HIGH Voltage Level

L, l = LOW Voltage Level

X = Don't Care

l, h (q) = Lower case letters indicate the state of the referenced input (or output) one set-up time prior to the LOW to HIGH clock transition.

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I _{OH} | Output Current — High | 54, 74 | | | -0.4 | mA |
| I _{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

AC CHARACTERISTICS: T_A = 25°C, V_{CC} = 5.0 V

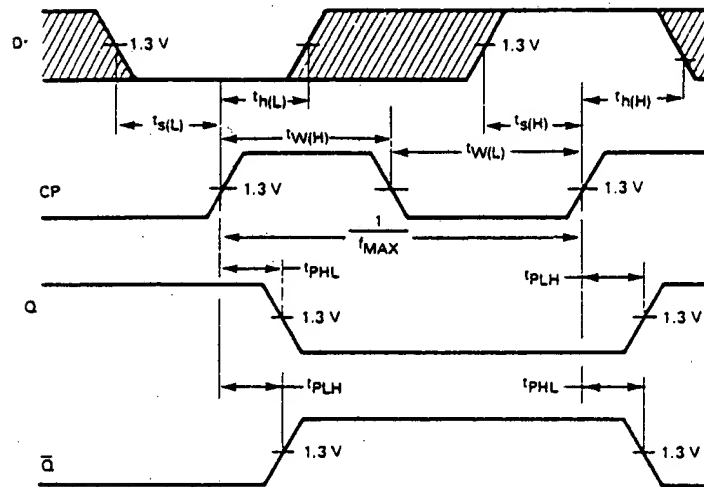
| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS | |
|------------------|-----------------------------|--------|-----|-----|-------|-----------------|--|
| | | MIN | TYP | MAX | | | |
| f _{MAX} | Maximum Clock Frequency | 25 | 33 | | MHz | Fig. 1 | V _{CC} = 5.0 V, C _L = 15 pF |
| t _{PLH} | Clock, Clear, Set to Output | | 13 | 25 | ns | Fig. 1 | |
| t _{PHL} | | | 25 | 40 | ns | | |

AC SETUP REQUIREMENTS: T_A = 25°C, V_{CC} = 5.0 V

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS | |
|-------------------|-------------------------------|--------|-----|-----|-------|-----------------|-------------------------|
| | | MIN | TYP | MAX | | | |
| t _{W(H)} | Clock | 25 | | | ns | Fig. 1 | V _{CC} = 5.0 V |
| t _{W(L)} | Clear, Set | 25 | | | ns | Fig. 2 | |
| t _s | Data Setup Time — HIGH LOW | 20 | | | ns | Fig. 1 | |
| | | 20 | | | ns | | |
| t _h | Hold Time | 5.0 | | | ns | Fig. 1 | |

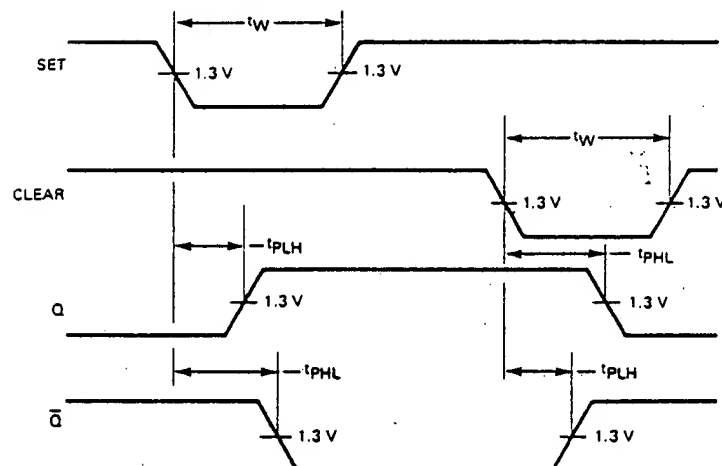
AC WAVEFORMS

Fig. 1 CLOCK TO OUTPUT DELAYS,
DATA SET-UP AND HOLD TIMES, CLOCK PULSE WIDTH



*The shaded areas indicate when the input is permitted to change for predictable output performance.

Fig. 2 SET AND CLEAR TO OUTPUT DELAYS,
SET AND CLEAR PULSE WIDTHS





SN54LS/74LS75 SN54LS/74LS77

DESCRIPTION — The TTL/MSI SN54LS/74LS75 and SN54LS/74LS77 are latches used as temporary storage for binary information between processing units and input/output or indicator units. Information present at a data (D) input is transferred to the Q output when the Enable is HIGH and the Q output will follow the data input as long as the Enable remains HIGH. When the Enable goes LOW, the information (that was present at the data input at the time the transition occurred) is retained at the Q output until the Enable is permitted to go HIGH.

The SN54LS/74LS75 features complementary Q and \bar{Q} output from a 4-bit latch and is available in the 16-pin packages. For higher component density applications the SN54LS/74LS77 4-bit latch is available in the 14-pin package with \bar{Q} outputs omitted.

4-BIT D LATCH

LOW POWER SCHOTTKY

PIN NAMES

| | |
|---------------------------|--------------------------------------|
| D_1 – D_4 | Data Inputs |
| E_{0-1} | Enable Input Latches 0, 1 |
| E_{2-3} | Enable Input Latches 2, 3 |
| Q_1 – Q_4 | Latch Outputs (Note b) |
| \bar{Q}_1 – \bar{Q}_4 | Complimentary Latch Outputs (Note b) |

LOADING (Note a)

| HIGH | LOW |
|----------|-------------|
| 0.5 U.L. | 0.25 U.L. |
| 2.0 U.L. | 1.0 U.L. |
| 2.0 U.L. | 1.0 U.L. |
| 10 U.L. | 5(2.5) U.L. |
| 10 U.L. | 5(2.5) U.L. |

Notes:

- 1 Unit Load (U.L.) = 40 μ A HIGH
- The Output LOW drive factor is 2.5 U.L. for Military (54) and 5 U.L. for Commercial (74) Temperature Ranges.

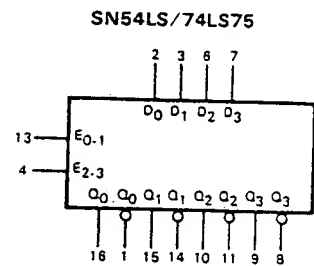
TRUTH TABLE (Each latch)

| t_n | t_{n+1} |
|-------|-----------|
| D | Q |
| H | H |
| L | L |

NOTES:

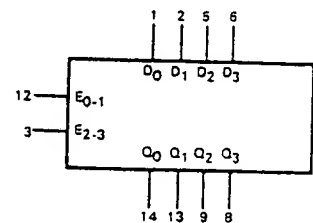
t_n = bit time before enable negative-going transition
 t_{n+1} = bit time after enable negative-going transition

LOGIC SYMBOLS



VCC = Pin 5
GND = Pin 12

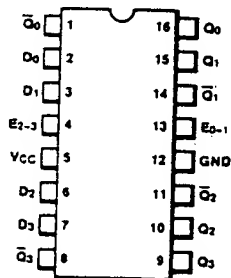
SN54LS/74LS77



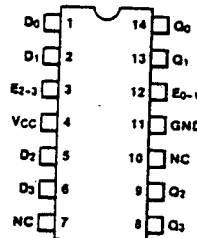
VCC = Pin 4
GND = Pin 11
NC = Pin 7, 10

CONNECTION DIAGRAMS DIP (TOP VIEW)

SN54LS/74LS75



SN54LS/74LS77



J Suffix — Case 620-08 (Ceramic) J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 648-05 (Plastic) N Suffix — Case 646-05 (Plastic)

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| SYMBOL | PARAMETER | | LIMITS | | | UNITS | TEST CONDITIONS |
|----------|---------------------------|---------|--------|-------|------|---------------|---|
| | | | MIN | TYP | MAX | | |
| V_{IH} | Input HIGH Voltage | | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V_{IL} | Input LOW Voltage | 54 | | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | | 0.8 | | |
| V_{IK} | Input Clamp Diode Voltage | | | -0.65 | -1.5 | V | $V_{CC} = \text{MIN}$, $I_{IN} = -18 \text{ mA}$ |
| V_{OH} | Output HIGH Voltage | 54 | 2.5 | 3.5 | | V | $V_{CC} = \text{MIN}$, $I_{OH} = \text{MAX}$, $V_{IN} = V_{IH}$ or V_{IL} per Truth Table |
| | | 74 | 2.7 | 3.5 | | V | |
| V_{OL} | Output LOW Voltage | 54, 74 | | 0.25 | 0.4 | V | $I_{OL} = 4.0 \text{ mA}$, $V_{CC} = V_{CC} \text{ MIN}$, $V_{IN} = V_{IL}$ or V_{IH} per Truth Table |
| | | 74 | | 0.35 | 0.5 | V | $I_{OL} = 8.0 \text{ mA}$, $V_{CC} = V_{CC} \text{ MIN}$, $V_{IN} = V_{IL}$ or V_{IH} per Truth Table |
| I_{IH} | Input HIGH Current | D Input | | | 20 | μA | $V_{CC} = \text{MAX}$, $V_{IN} = 2.7 \text{ V}$ |
| | | E Input | | | 80 | | |
| | | D Input | | | 0.1 | mA | $V_{CC} = \text{MAX}$, $V_{IN} = 7.0 \text{ V}$ |
| I_{IL} | Input LOW Current | E Input | | | 0.4 | | $V_{CC} = \text{MAX}$, $V_{IN} = 7.0 \text{ V}$ |
| | | D Input | | | -0.4 | mA | |
| I_{OS} | Short Circuit Current | | -20 | | -100 | mA | $V_{CC} = \text{MAX}$ |
| I_{CC} | Power Supply Current | | | | 12 | mA | $V_{CC} = \text{MAX}$ |

AC CHARACTERISTICS: $T_A = 25^\circ\text{C}$, $V_{CC} = 5.0 \text{ V}$

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|--------------------------------------|---|--------|-----------|----------|-------|---|
| | | MIN | TYP | MAX | | |
| t _{PLH} t _{PHL} | Propagation Delay, Data to Q | | 15 9.0 | 27 17 | ns | V _{CC} = 5.0 V C _L = 15 pF |
| t _{PLH} t _{PHL} | Propagation Delay, Data to \overline{Q} | | 12 7.0 | 20 15 | ns | |
| t _{PLH} t _{PHL} | Propagation Delay, Enable to Q | | 15 14 | 27 25 | ns | |
| t _{PLH} t _{PHL} | Propagation Delay, Enable to \overline{Q} | | 16 7.0 | 30 15 | ns | |

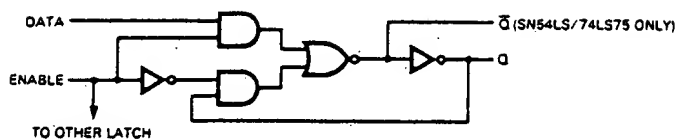
DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| SYMBOL | PARAMETER | | LIMITS | | | UNITS | TEST CONDITIONS |
|----------|---------------------------|---------|--------|-------|------|---------------|---|
| | | | MIN | TYP | MAX | | |
| V_{IH} | Input HIGH Voltage | | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V_{IL} | Input LOW Voltage | 54 | | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | | 0.8 | | |
| V_{IK} | Input Clamp Diode Voltage | | | -0.65 | -1.5 | V | $V_{CC} = \text{MIN}$, $I_{IN} = -18 \text{ mA}$ |
| V_{OH} | Output HIGH Voltage | 54 | 2.5 | 3.5 | | V | $V_{CC} = \text{MIN}$, $I_{OH} = \text{MAX}$, $V_{IN} = V_{IH}$ or V_{IL} per Truth Table |
| | | 74 | 2.7 | 3.5 | | V | |
| V_{OL} | Output LOW Voltage | 54, 74 | | 0.25 | 0.4 | V | $I_{OL} = 4.0 \text{ mA}$ $V_{CC} = V_{CC} \text{ MIN}$, $V_{IN} = V_{IL}$ or V_{IH} per Truth Table |
| | | 74 | | 0.35 | 0.5 | V | $I_{OL} = 8.0 \text{ mA}$ |
| I_{IH} | Input HIGH Current | D Input | | | 20 | μA | $V_{CC} = \text{MAX}$, $V_{IN} = 2.7 \text{ V}$ |
| | | E Input | | | 80 | μA | |
| I_{IL} | Input LOW Current | D Input | | | 0.1 | mA | $V_{CC} = \text{MAX}$, $V_{IN} = 7.0 \text{ V}$ |
| | | E Input | | | 0.4 | mA | |
| I_{OS} | Short Circuit Current | | -20 | | -100 | mA | $V_{CC} = \text{MAX}$ |
| I_{CC} | Power Supply Current | | | | 13 | mA | $V_{CC} = \text{MAX}$ |

AC CHARACTERISTICS: $T_A = 25^\circ\text{C}$, $V_{CC} = 5.0 \text{ V}$

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------------|--------------------------------|--------|-----------|----------|-------|---|
| | | MIN | TYP | MAX | | |
| t_{PLH} t_{PHL} | Propagation Delay, Data to Q | | 11 9.0 | 19 17 | ns | $V_{CC} = 5.0 \text{ V}$ $C_L = 15 \text{ pF}$ |
| t_{PLH} t_{PHL} | Propagation Delay, Enable to Q | | 10 10 | 18 18 | ns | |

LOGIC DIAGRAM



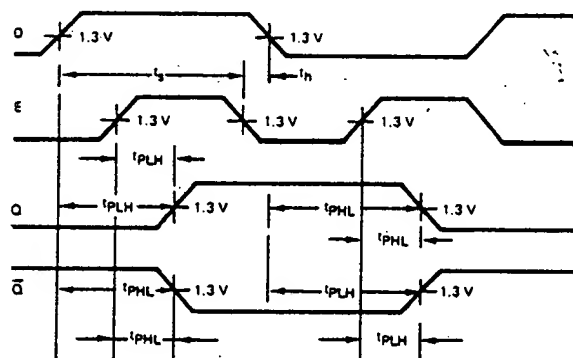
GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|----------|-------------------------------------|----------|-------------|------------|-------------|------|
| V_{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T_A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I_{OH} | Output Current — High | 54, 74 | | | -0.4 | mA |
| I_{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

AC SETUP REQUIREMENTS: $T_A = 25^\circ\text{C}$, $V_{CC} = 5.0\text{ V}$

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|--------|-------------------------|--------|-----|-----|-------|-------------------------|
| | | MIN | TYP | MAX | | |
| t_W | Enable Pulse Width High | 20 | | | ns | $V_{CC} = 5.0\text{ V}$ |
| t_s | Setup Time | 20 | | | ns | |
| t_h | Hold Time | 0 | | | ns | |

AC WAVE FORMS



DEFINITION OF TERMS:

SETUP TIME (t_s) — is defined as the minimum time required for the correct logic level to be present at the logic input prior to the clock transition from HIGH-to-LOW in order to be recognized and transferred to the outputs.

HOLD TIME (t_h) — is defined as the minimum time following the clock transition from HIGH-to-LOW that the logic level must be maintained at the input in order to ensure continued recognition. A negative HOLD TIME indicates that the correct logic level may be released prior to the clock transition from HIGH-to-LOW and still be recognized.



MOTOROLA

DESCRIPTION — The SN54LS/74LS76A offers individual J, K, Clock Pulse, Direct Set and Direct Clear inputs. These dual flip-flops are designed so that when the clock goes HIGH, the inputs are enabled and data will be accepted. The Logic Level of the J and K inputs will perform according to the Truth Table as long as minimum set-up times are observed. Input data is transferred to the outputs on the HIGH-to-LOW clock transitions.

**SN54LS76A
SN74LS76A**

**DUAL JK FLIP-FLOP
WITH SET AND CLEAR**
LOW POWER SCHOTTKY

MODE SELECT — TRUTH TABLE

| OPERATING MODE | INPUTS | | | | OUTPUTS | |
|------------------|-------------|-------------|---|---|-----------|-----------|
| | \bar{S}_0 | \bar{C}_0 | J | K | Q | \bar{Q} |
| Set | L | H | X | X | H | L |
| Reset (Clear) | L | L | X | X | L | H |
| *Undetermined | L | X | X | X | H | H |
| Toggle | H | H | h | h | \bar{q} | q |
| Load "0" (Reset) | H | H | l | h | L | H |
| Load "1" (Set) | H | H | h | l | H | L |
| Hold | H | H | l | l | q | \bar{q} |

*Both outputs will be HIGH while both \bar{S}_0 and \bar{C}_0 are LOW, but the output states are unpredictable if \bar{S}_0 and \bar{C}_0 go HIGH simultaneously.

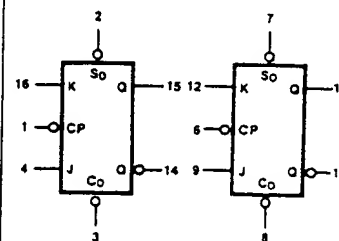
H, h = HIGH Voltage Level

L, l = LOW Voltage Level

X = Immaterial

l, h (q) = Lower case letters indicate the state of the referenced input (or output) one set-up time prior to the HIGH-to-LOW clock transition.

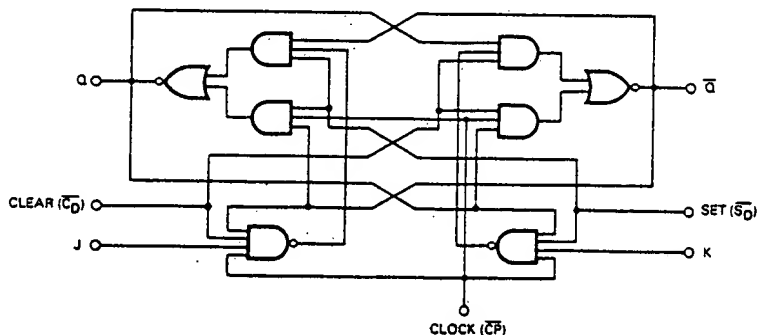
LOGIC SYMBOL



V_{CC} = Pin 5
GND = Pin 13

J Suffix — Case 620-08 (Ceramic)
N Suffix — Case 648-05 (Plastic)

LOGIC DIAGRAM



GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I _{OH} | Output Current — High | 54, 74 | | | -0.4 | mA |
| I _{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| SYMBOL | PARAMETER | | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------------|---------------------------|------------------------|--------|-------|-------------------|-------|---|
| | | | MIN | TYP | MAX | | |
| V _{IH} | Input HIGH Voltage | | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V _{IL} | Input LOW Voltage | 54 | | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | | 0.8 | | |
| V _{IK} | Input Clamp Diode Voltage | | | -0.65 | -1.5 | V | V _{CC} = MIN, I _{IN} = -18 mA |
| V _{OH} | Output HIGH Voltage | 54 | 2.5 | 3.5 | | V | V _{CC} = MIN, I _{OH} = MAX, V _{IN} = V _{IH} or V _{IL} per Truth Table |
| | | 74 | 2.7 | 3.5 | | V | |
| V _{OL} | Output LOW Voltage | 54, 74 | | 0.25 | 0.4 | V | I _{OL} = 4.0 mA, V _{CC} = V _{CC} MIN, V _{IN} = V _{IL} or V _{IH} per Truth Table |
| | | 74 | | 0.35 | 0.5 | V | |
| I _{IH} | Input HIGH Current | J, K Clear Clock | | | 20 60 80 | μA | V _{CC} = MAX, V _{IN} = 2.7 V |
| | | J, K Clear Clock | | | 0.1 0.3 0.4 | mA | |
| | | J, K Clear, Clock | | | -0.4 -0.8 | mA | |
| I _{IL} | Input LOW Current | J, K Clear, Clock | | | -0.4 -0.8 | mA | V _{CC} = MAX, V _{IN} = 0.4 V |
| I _{OS} | Short Circuit Current | | -20 | | -100 | mA | V _{CC} = MAX |
| I _{CC} | Power Supply Current | | | | 6.0 | mA | V _{CC} = MAX |

AC CHARACTERISTICS: T_A = 25°C, V_{CC} = 5.0 V

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------|-----------------------------|--------|-----|-----|-------|---|
| | | MIN | TYP | MAX | | |
| f _{MAX} | Maximum Clock Frequency | 30 | 45 | | MHz | V _{CC} = 5.0 V C _L = 15 pF |
| t _{PLH} | Clock, Clear, Set to Output | | 15 | 20 | ns | |
| t _{PHL} | | | 15 | 20 | ns | |

AC SETUP REQUIREMENTS: T_A = 25°C, V_{CC} = 5.0 V

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|----------------|------------------------|--------|-----|-----|-------|-------------------------|
| | | MIN | TYP | MAX | | |
| t _W | Clock Pulse Width High | 20 | | | ns | V _{CC} = 5.0 V |
| t _W | Clear Set Pulse Width | 25 | | | ns | |
| t _s | Setup Time | 20 | | | ns | |
| t _h | Hold Time | 0 | | | ns | |



MOTOROLA

DESCRIPTION — The SN54LS/74LS78A offers individual J, K, and Direct Set inputs as well as common Clock Pulse and Common Direct Clear Inputs. These dual Flip-Flops are designed so that when the clock goes HIGH, the inputs are enabled and data will be accepted. The Logic Level of the J and K inputs may be allowed to change when the clock pulse is HIGH and the bistable will perform according to the Truth Table as long as minimum setup times are observed. Input data is transferred to the outputs on the HIGH-to-LOW Clock Transition.

J Suffix — Case 632-07 (Ceramic)
N Suffix — Case 646-05 (Plastic)

**SN54LS78A
SN74LS78A**

DUAL JK FLIP-FLOP

LOW POWER SCHOTTKY

MODE SELECT — TRUTH TABLE

| OPERATING MODE | INPUTS | | | | OUTPUTS | |
|------------------|------------------|------------------|---|---|----------------|----------------|
| | $\overline{S_D}$ | $\overline{C_D}$ | J | K | Q | \overline{Q} |
| Set | L | H | X | X | H | L |
| Reset (Clear) | H | L | X | X | L | H |
| *Undetermined | L | L | X | X | H | H |
| Toggle | H | H | h | h | \overline{q} | q |
| Load "0" (Reset) | H | H | l | h | L | H |
| Load "1" (Set) | H | H | h | l | H | L |
| Hold | H | H | l | l | q | \overline{q} |

*Both outputs will be HIGH while both $\overline{S_D}$ and $\overline{C_D}$ are LOW, but the output states are unpredictable if $\overline{S_D}$ and $\overline{C_D}$ go HIGH simultaneously.

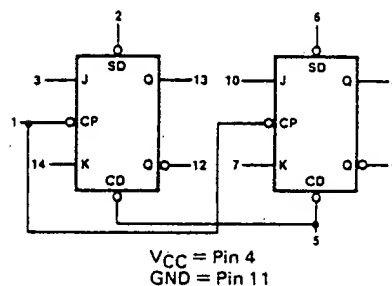
H, h = HIGH Voltage Level

L, l = LOW Voltage Level

X = Immaterial

l, h (q) = Lower case letters indicate the state of the referenced input (or output) one set-up time prior to the HIGH-to-LOW clock transition.

LOGIC SYMBOL



GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I _{OH} | Output Current — High | 54, 74 | | | -0.4 | mA |
| I _{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| SYMBOL | PARAMETER | | LIMITS | | | UNITS | TEST CONDITIONS |
|----------|---|--------|--------|-------|--------------------------|---------------|---|
| | | | MIN | TYP | MAX | | |
| V_{IH} | Input HIGH Voltage | | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V_{IL} | Input LOW Voltage | 54 | | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | | 0.8 | | |
| V_{IK} | Input Clamp Diode Voltage | | | -0.65 | -1.5 | V | $V_{CC} = \text{MIN}$, $I_{IN} = -18 \text{ mA}$ |
| V_{OH} | Output HIGH Voltage | 54 | 2.5 | 3.5 | | V | $V_{CC} = \text{MIN}$, $I_{OH} = \text{MAX}$, $V_{IN} = V_{IH}$ or V_{IL} per Truth Table |
| | | 74 | 2.7 | 3.5 | | V | |
| V_{OL} | Output LOW Voltage | 54, 74 | | 0.25 | 0.4 | V | $I_{OL} = 4.0 \text{ mA}$, $V_{CC} = V_{CC} \text{ MIN}$, $V_{IN} = V_{IL}$ or V_{IH} per Truth Table |
| | | 74 | | 0.35 | 0.5 | V | $I_{OL} = 8.0 \text{ mA}$ |
| I_{IH} | Input HIGH Current J, K Clear Set Clock | | | | 20 120 60 160 | μA | $V_{CC} = \text{MAX}$, $V_{IN} = 2.7 \text{ V}$ |
| | J, K Clear Set Clock | | | | 0.1 0.6 0.3 0.8 | mA | $V_{CC} = \text{MAX}$, $V_{IN} = 7.0 \text{ V}$ |
| | Input LOW Current J, K Set Clock, Clear | | | | -0.4 -0.8 -1.6 | mA | $V_{CC} = \text{MAX}$, $V_{IN} = 0.4 \text{ V}$ |
| | | | | | | | |
| I_{OS} | Output Short Circuit Current | | -20 | | -100 | mA | $V_{CC} = \text{MAX}$, $V_{OUT} = 0 \text{ V}$ |
| I_{CC} | Power Supply Current | | | 4.0 | 6.0 | mA | $V_{CC} = \text{MAX}$, $V_{CP} = 0 \text{ V}$ |

AC CHARACTERISTICS: $T_A = 25^\circ\text{C}$, $V_{CC} = 5.0 \text{ V}$

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|-----------|-----------------------------|--------|-----|-----|-------|---|
| | | MIN | TYP | MAX | | |
| f_{MAX} | Maximum Clock Frequency | 30 | 45 | | MHz | $V_{CC} = 5.0 \text{ V}$ $C_L = 15 \text{ pF}$ |
| t_{PLH} | Clear, Clock, Set to Output | | 15 | 20 | ns | |
| t_{PHL} | | | 15 | 20 | ns | |

AC SETUP REQUIREMENTS: $T_A = 25^\circ\text{C}$, $V_{CC} = 5.0 \text{ V}$

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|--------|------------------------|--------|-----|-----|-------|--------------------------|
| | | MIN | TYP | MAX | | |
| t_W | Clock Pulse Width High | 20 | | | ns | $V_{CC} = 5.0 \text{ V}$ |
| t_W | Clear Set Pulse Width | 25 | | | ns | |
| t_s | Setup Time | 20 | | | ns | |
| t_h | Hold Time | 0 | | | ns | |



MOTOROLA

SN54LS83A **SN74LS83A**

DESCRIPTION — The SN54LS/74LS83A is a high-speed 4-Bit Binary Full Adder with internal carry lookahead. It accepts two 4-bit binary words (A_1 — A_4 , B_1 — B_4) and a Carry Input (C_0). It generates the binary Sum outputs Σ_1 — Σ_4 and the Carry Output (C_4) from the most significant bit. The LS83A operates with either active HIGH or active LOW operands (positive or negative logic). The SN54LS/74LS283 is recommended for new designs since it is identical in function with this device and features standard corner power pins.

4-BIT BINARY FULL ADDER **WITH FAST CARRY** LOW POWER SCHOTTKY

PIN NAMES

| | |
|-------------------------|-----------------------|
| A_1 — A_4 | Operand A Inputs |
| B_1 — B_4 | Operand B Inputs |
| C_0 | Carry Input |
| Σ_1 — Σ_4 | Sum Outputs (Note b) |
| C_4 | Carry Output (Note b) |

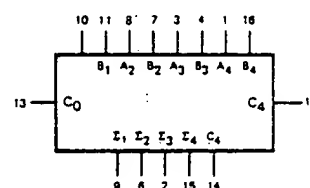
LOADING (Note a)

| HIGH | LOW |
|----------|-------------|
| 1.0 U.L. | 0.5 U.L. |
| 1.0 U.L. | 0.5 U.L. |
| 0.5 U.L. | 0.25 U.L. |
| 10 U.L. | 5(2.5) U.L. |
| 10 U.L. | 5(2.5) U.L. |

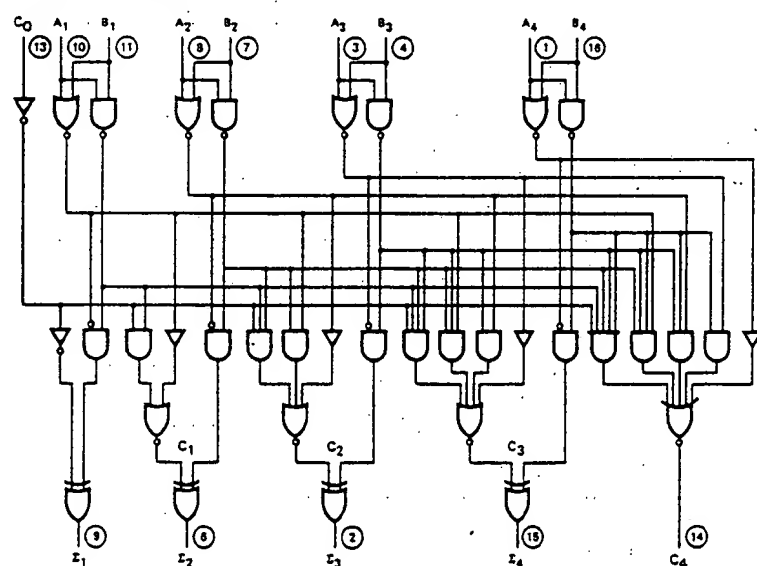
NOTES:

- 1 TTL Unit Load (U.L.) = 40 μ A HIGH/1.6 mA LOW.
- The Output LOW drive factor is 2.5 U.L. for Military (54) and 5 U.L. for commercial (74) Temperature Ranges.

LOGIC SYMBOL

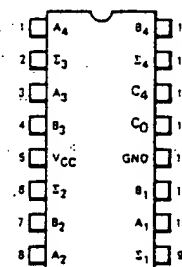


LOGIC DIAGRAM



V_{CC} = Pin 5
GND = Pin 12
○ = Pin Numbers

CONNECTION DIAGRAM DIP (TOP VIEW)



J Suffix — Case 620-08 (Ceramic)
N Suffix — Case 648-05 (Plastic)

NOTE:

The Flatpak version has the same pinouts (Connection Diagram) as the Dual In-Line Package.

FUNCTIONAL DESCRIPTION — The LS83A adds two 4-bit binary words (A plus B) plus the incoming carry. The binary sum appears on the sum outputs (Σ_1 — Σ_4) and outgoing carry (C_4) outputs.

$$C_0 + (A_1 + B_1) + 2(A_2 + B_2) + 4(A_3 + B_3) + 8(A_4 + B_4) = \Sigma_1 + 2\Sigma_2 + 4\Sigma_3 + 8\Sigma_4 + 16C_4$$

Where: (+) = plus

Due to the symmetry of the binary add function the LS83A can be used with either all inputs and outputs active HIGH (positive logic) or with all inputs and outputs active LOW (negative logic). Note that with active HIGH Inputs, Carry Input can not be left open, but must be held LOW when no carry in is intended.

Example:

| | C ₀ | A ₁ | A ₂ | A ₃ | A ₄ | B ₁ | B ₂ | B ₃ | B ₄ | Σ ₁ | Σ ₂ | Σ ₃ | Σ ₄ | C ₄ | |
|--------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|------------------|
| Logic Levels | L | L | H | L | H | H | L | L | H | H | H | L | L | H | |
| Active HIGH | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | (10+9 = 19) |
| Active LOW | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | (carry+5+6 = 12) |

Interchanging inputs of equal weight does not affect the operation, thus C₀, A₁, B₁, can be arbitrarily assigned to pins 10, 11, 13, etc.

FUNCTIONAL TRUTH TABLE

| C(n-1) | A _n | B _n | Σ _n | C _n |
|--------|----------------|----------------|----------------|----------------|
| L | L | L | L | L |
| L | L | H | H | L |
| L | H | L | H | L |
| L | H | H | L | H |
| H | L | L | H | L |
| H | L | H | L | H |
| H | H | L | L | H |
| H | H | H | H | H |

C₁ — C₃ are generated internally

C₀ — is an external input

C₄ — is an output generated internally

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I _{OH} | Output Current — High | 54, 74 | | | -0.4 | mA |
| I _{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| SYMBOL | PARAMETER | | LIMITS | | | UNITS | TEST CONDITIONS |
|----------|---|--------|--------|-------|----------------|---------------|---|
| | | | MIN | TYP | MAX | | |
| V_{IH} | Input HIGH Voltage | | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V_{IL} | Input LOW Voltage | 54 | | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | | 0.8 | | |
| V_{IK} | Input Clamp Diode Voltage | | | -0.65 | -1.5 | V | $V_{CC} = \text{MIN}$, $I_{IN} = -18 \text{ mA}$ |
| V_{OH} | Output HIGH Voltage | 54 | 2.5 | 3.5 | | V | $V_{CC} = \text{MIN}$, $I_{OH} = \text{MAX}$, $V_{IN} = V_{IH}$ or V_{IL} per Truth Table |
| | | 74 | 2.7 | 3.5 | | V | |
| V_{OL} | Output LOW Voltage | 54, 74 | | 0.25 | 0.4 | V | $I_{OL} = 4.0 \text{ mA}$ |
| | | 74 | | 0.35 | 0.5 | V | $I_{OL} = 8.0 \text{ mA}$ |
| I_{IH} | Input HIGH Current C_0 A or B | | | | 20 40 | μA | $V_{CC} = \text{MAX}$, $V_{IN} = 2.7 \text{ V}$ |
| | C_0 A or B | | | | 0.1 0.2 | mA | $V_{CC} = \text{MAX}$, $V_{IN} = 7.0 \text{ V}$ |
| I_{IL} | Input LOW Current C_0 A or B | | | | -0.4 -0.8 | mA | $V_{CC} = \text{MAX}$, $V_{IN} = 0.4 \text{ V}$ |
| I_{OS} | Output Short Circuit Current | | -20 | | -100 | mA | $V_{CC} = \text{MAX}$ |
| I_{CC} | Power Supply Current All Inputs Grounded All Inputs at 4.5 V, Except B All Inputs at 4.5 V | | | | 39 34 34 | mA | $V_{CC} = \text{MAX}$ |

AC CHARACTERISTICS: $T_A = 25^\circ\text{C}$

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------------|---|--------|----------|----------|-------|--|
| | | MIN | TYP | MAX | | |
| t_{PLH} t_{PHL} | Propagation Delay, C_0 Input to any Σ Output | | 16 15 | 24 24 | ns | $V_{CC} = 5.0 \text{ V}$ $C_L = 15 \text{ pF}$ Figures 1 and 2 |
| t_{PLH} t_{PHL} | Propagation Delay, Any A or B Input to Σ Outputs | | 15 15 | 24 24 | ns | |
| t_{PLH} t_{PHL} | Propagation Delay, C_0 Input to C_4 Output | | 11 15 | 17 22 | ns | |
| t_{PLH} t_{PHL} | Propagation Delay, Any A or B Input to C_4 Output | | 11 12 | 17 17 | ns | |

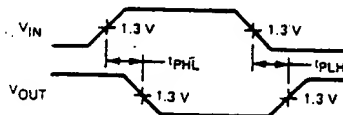
AC WAVEFORMS


Fig. 1

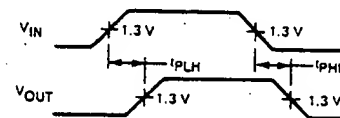


Fig. 2



MOTOROLA

DESCRIPTION — The SN54LS/74LS85 is a 4-Bit Magnitude Comparator which compares two 4-bit words (A, B), each word having four Parallel Inputs (A_0 - A_3 , B_0 - B_3); A_3 , B_3 being the most significant inputs. Operation is not restricted to binary codes, the device will work with any monotonic code. Three Outputs are provided: "A greater than B" ($O_A > B$), "A less than B" ($O_A < B$), "A equal to B" ($O_A = B$). Three Expander Inputs, $I_A > B$, $I_A < B$, $I_A = B$, allow cascading without external gates. For proper compare operation, the Expander Inputs to the least significant position must be connected as follows: $I_A < B = I_A > B = L$, $I_A = B = H$. For serial (ripple) expansion, the $O_A > B$, $O_A < B$ and $O_A = B$ Outputs are connected respectively to the $I_A > B$, $I_A < B$, and $I_A = B$ inputs of the next most significant comparator, as shown in Figure 1. Refer to Applications section of data sheet for high speed method of comparing large words.

The Truth Table on the following page describes the operation of the SN54LS/74LS85 under all possible logic conditions. The upper 11 lines describe the normal operation under all conditions that will occur in a single device or in a series expansion scheme. The lower five lines describe the operation under abnormal conditions on the cascading inputs. These conditions occur when the parallel expansion technique is used.

- EASILY EXPANDABLE
- BINARY OR BCD COMPARISON
- $O_A > B$, $O_A < B$, AND $O_A = B$ OUTPUTS AVAILABLE

PIN NAMES

| | |
|-------------------------------|----------------------------------|
| A_0 - A_3 , B_0 - B_3 | Parallel Inputs |
| $I_A = B$ | A = B Expander Inputs |
| $I_A < B$, $I_A > B$ | A < B, A > B, Expander Inputs |
| $O_A > B$ | A Greater Than B Output (Note b) |
| $O_A < B$ | B Greater Than A Output (Note b) |
| $O_A = B$ | A Equal to B Output (Note b) |

Notes:

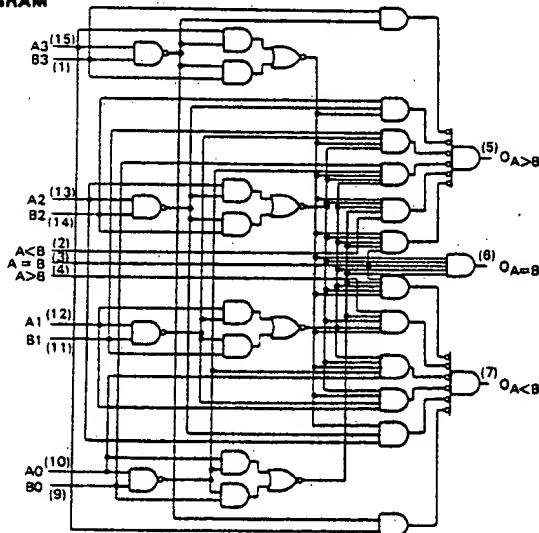
a. 1 TTL Unit Load (U.L.) = 40 μ A HIGH/1.6 mA LOW

b. The Output LOW drive factor is 2.5 U.L. for Military (54) and 5 U.L. for Commercial (74) Temperature Ranges.

LOADING (Note a)

| | HIGH | LOW |
|-------------------------------|----------|--------------|
| A_0 - A_3 , B_0 - B_3 | 1.5 U.L. | 0.75 U.L. |
| $I_A = B$ | 1.5 U.L. | 0.75 U.L. |
| $I_A < B$, $I_A > B$ | 0.5 U.L. | 0.25 U.L. |
| $O_A > B$ | 10 U.L. | 5 (2.5) U.L. |
| $O_A < B$ | 10 U.L. | 5 (2.5) U.L. |
| $O_A = B$ | 10 U.L. | 5 (2.5) U.L. |

LOGIC DIAGRAM

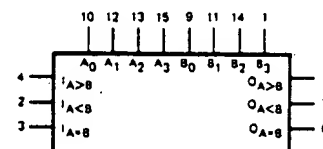


SN54LS85 **SN74LS85**

4-BIT MAGNITUDE **COMPARATOR**

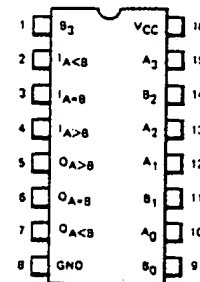
LOW POWER SCHOTTKY

LOGIC SYMBOL



V_{CC} = Pin 16
GND = Pin 8

CONNECTION DIAGRAM
DIP (TOP VIEW)



J Suffix — Case 620-08 (Ceramic)
N Suffix — Case 648-05 (Plastic)

NOTE:

The Flatpak version has the same pinouts (Connection Diagram) as the Dual In-Line Package.

TRUTH TABLE

| COMPARING INPUTS | | | | CASCADING INPUTS | | | OUTPUTS | | |
|--------------------------------|--------------------------------|--------------------------------|--------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| A ₃ B ₃ | A ₂ B ₂ | A ₁ B ₁ | A ₀ B ₀ | I _A >B | I _A <B | I _A =B | O _A >B | O _A <B | O _A =B |
| A ₃ >B ₃ | X | X | X | X | X | X | H | L | L |
| A ₃ <B ₃ | X | X | X | X | X | X | L | H | L |
| A ₃ =B ₃ | A ₂ >B ₂ | X | X | X | X | X | H | L | L |
| A ₃ =B ₃ | A ₂ <B ₂ | X | X | X | X | X | L | H | L |
| A ₃ =B ₃ | A ₂ =B ₂ | A ₁ >B ₁ | X | X | X | X | H | L | L |
| A ₃ =B ₃ | A ₂ =B ₂ | A ₁ <B ₁ | X | X | X | X | L | H | L |
| A ₃ =B ₃ | A ₂ =B ₂ | A ₁ =B ₁ | A ₀ >B ₀ | X | X | X | H | L | L |
| A ₃ =B ₃ | A ₂ =B ₂ | A ₁ =B ₁ | A ₀ <B ₀ | X | X | X | L | H | L |
| A ₃ =B ₃ | A ₂ =B ₂ | A ₁ =B ₁ | A ₀ =B ₀ | H | L | L | H | L | L |
| A ₃ =B ₃ | A ₂ =B ₂ | A ₁ =B ₁ | A ₀ =B ₀ | L | H | L | L | H | L |
| A ₃ =B ₃ | A ₂ =B ₂ | A ₁ =B ₁ | A ₀ =B ₀ | X | X | H | L | L | H |
| A ₃ =B ₃ | A ₂ =B ₂ | A ₁ =B ₁ | A ₀ =B ₀ | H | H | L | L | L | L |
| A ₃ =B ₃ | A ₂ =B ₂ | A ₁ =B ₁ | A ₀ =B ₀ | L | L | L | H | H | L |

H = HIGH Level
 L = LOW Level
 X = IMMATERIAL

4

GUARANTEED OPERATING RANGES

| SYMBOL | PARAMETER | | MIN | TYP | MAX | UNIT |
|-----------------|-------------------------------------|----------|-------------|------------|-------------|------|
| V _{CC} | Supply Voltage | 54 74 | 4.5 4.75 | 5.0 5.0 | 5.5 5.25 | V |
| T _A | Operating Ambient Temperature Range | 54 74 | -55 0 | 25 25 | 125 70 | °C |
| I _{OH} | Output Current — High | 54, 74 | | | -0.4 | mA |
| I _{OL} | Output Current — Low | 54 74 | | | 4.0 8.0 | mA |

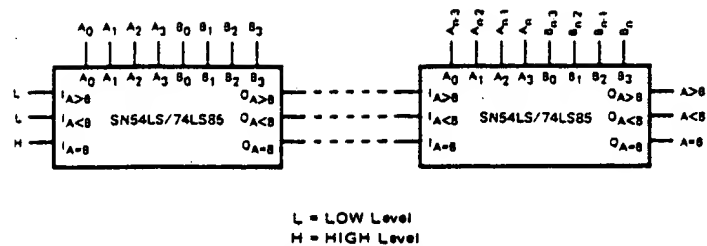


Fig. 1. COMPARING TWO n-BIT WORDS

APPLICATIONS

Figure 2 shows a high speed method of comparing two 24-bit words with only two levels of device delay. With the technique shown in Figure 1, six levels of device delay result when comparing two 24-bit words. The parallel technique can be expanded to any number of bits, see Table I.

TABLE I

| WORD LENGTH | NUMBER OF PKGS. |
|-------------|-----------------|
| 1-4 Bits | 1 |
| 5-24 Bits | 2 - 6 |
| 25-120 Bits | 8 - 31 |

NOTE:
The SN54LS/74LS85 can be used as a 5-bit comparator only when the outputs are used to drive the A_0 - A_3 and B_0 - B_3 inputs of another SN54LS/74LS85 as shown in Figure 2 in positions #1, 2, 3, and 4.

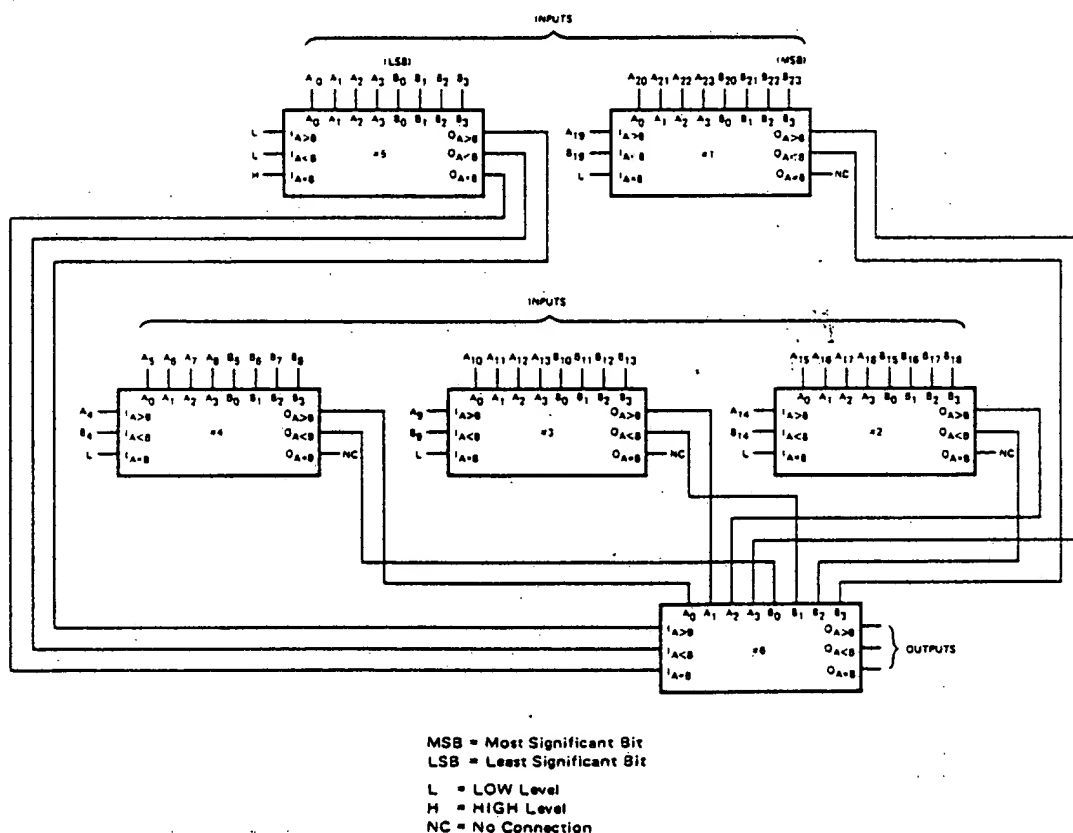


Fig. 2. COMPARISON OF TWO 24-BIT WORDS

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|----------|---|--------|-------|--------------|---------------|---|
| | | MIN | TYP | MAX | | |
| V_{IH} | Input HIGH Voltage | 2.0 | | | V | Guaranteed Input HIGH Voltage for All Inputs |
| V_{IL} | Input LOW Voltage | 54 | | 0.7 | V | Guaranteed Input LOW Voltage for All Inputs |
| | | 74 | | 0.8 | | |
| V_{IK} | Input Clamp Diode Voltage | | -0.65 | -1.5 | V | $V_{CC} = \text{MIN}$, $I_{IN} = -18 \text{ mA}$ |
| V_{OH} | Output HIGH Voltage | 54 | 2.5 | 3.5 | V | $V_{CC} = \text{MIN}$, $I_{OH} = \text{MAX}$, $V_{IN} = V_{IH}$ or V_{IL} per Truth Table |
| | | 74 | 2.7 | 3.5 | V | |
| V_{OL} | Output LOW Voltage | 54, 74 | 0.25 | 0.4 | V | $I_{OL} = 4.0 \text{ mA}$ |
| | | 74 | 0.35 | 0.5 | V | $I_{OL} = 8.0 \text{ mA}$ |
| I_{IH} | Input HIGH Current $A < B$, $A > B$ Other Inputs | | | 20 60 | μA | $V_{CC} = \text{MAX}$, $V_{IN} = 2.7 \text{ V}$ |
| | $A < B$, $A > B$ Other Inputs | | | 0.1 0.3 | mA | $V_{CC} = \text{MAX}$, $V_{IN} = 7.0 \text{ V}$ |
| I_{IL} | Input LOW Current $A < B$, $A > B$ Other Inputs | | | -0.4 -1.2 | mA | $V_{CC} = \text{MAX}$, $V_{IN} = 0.4 \text{ V}$ |
| I_{OS} | Output Short Circuit Current | -20 | | -100 | mA | $V_{CC} = \text{MAX}$ |
| I_{CC} | Power Supply Current | | | 20 | mA | $V_{CC} = \text{MAX}$ |

AC CHARACTERISTICS: $T_A = 25^\circ\text{C}$, $V_{CC} = 5.0 \text{ V}$

| SYMBOL | PARAMETER | LIMITS | | | UNITS | TEST CONDITIONS |
|------------------------|---------------------------------|--------|----------|----------|-------|---|
| | | MIN | TYP | MAX | | |
| t_{PLH} t_{PHL} | Any A or B to $A < B$, $A > B$ | | 24 20 | 36 30 | ns | $V_{CC} = 5.0 \text{ V}$ $C_L = 15 \text{ pF}$ |
| t_{PLH} t_{PHL} | Any A or B to $A = B$ | | 27 23 | 45 45 | ns | |
| t_{PLH} t_{PHL} | $A < B$ or $A = B$ to $A > B$ | | 14 11 | 22 17 | ns | |
| t_{PLH} t_{PHL} | $A = B$ to $A = B$ | | 13 13 | 20 26 | ns | |
| t_{PLH} t_{PHL} | $A > B$ or $A = B$ to $A < B$ | | 14 11 | 22 17 | ns | |

AC WAVEFORMS

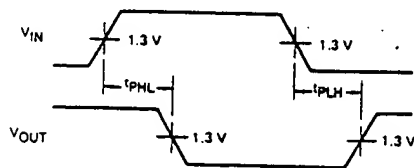


Fig. 3

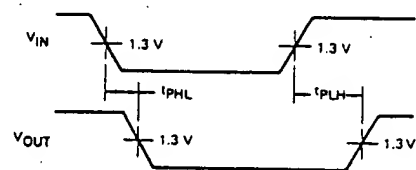


Fig. 4

SCHOTTKY TTL

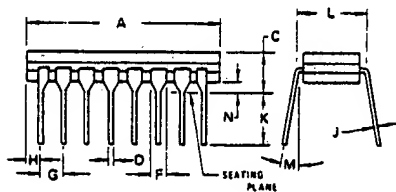
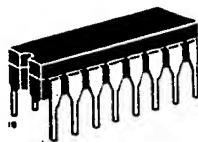


Package Outlines

PACKAGE OUTLINES

CERAMIC DUAL IN-LINE

Case 620-08 16-Pin Ceramic Dual In-Line

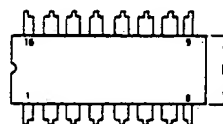


| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|-------|-----------|-------|
| | MIN | MAX | MIN | MAX |
| A | 19.05 | 19.94 | 0.750 | 0.785 |
| B | 6.10 | 7.49 | 0.240 | 0.295 |
| C | — | 5.08 | — | 0.200 |
| D | 0.38 | 0.53 | 0.015 | 0.021 |
| F | 1.40 | 1.78 | 0.055 | 0.070 |
| G | 2.54 BSC | | 0.100 BSC | |
| H | 0.51 | 1.14 | 0.020 | 0.045 |
| J | 0.20 | 0.30 | 0.008 | 0.012 |
| K | 3.18 | 4.32 | 0.125 | 0.170 |
| L | 7.62 BSC | | 0.300 BSC | |
| M | — | 15° | — | 15° |
| N | 0.51 | 1.02 | 0.020 | 0.040 |

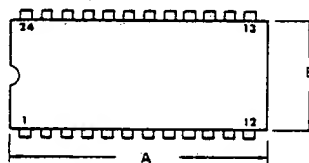
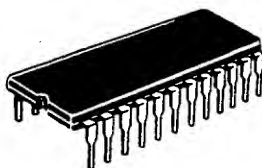
CASE 620-08

- LEADS WITHIN 0.13 mm (0.005) RADIUS OF TRUE POSITION AT SEATING PLANE AT MAXIMUM MATERIAL CONDITION.
- PACKAGE INDEX; NOTCH IN LEAD NOTCH IN CERAMIC OR INK DOT.
- DIM "L" TO CENTER OF LEADS WHEN FORMED PARALLEL.

- DIM "A" AND "B" DO NOT INCLUDE GLASS RUN-OUT.
- DIM "F" MAY NARROW TO 0.76 mm (0.030) WHERE THE LEAD ENTERS THE CERAMIC BODY.



Case 623-05 24-Pin Ceramic Dual In-Line



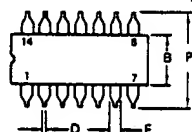
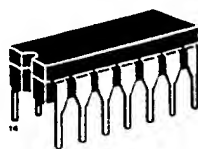
| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|-------|-----------|-------|
| | MIN | MAX | MIN | MAX |
| A | 31.24 | 32.77 | 1.230 | 1.290 |
| B | 12.70 | 15.49 | 0.500 | 0.610 |
| C | 4.08 | 5.59 | 0.160 | 0.220 |
| D | 0.41 | 0.51 | 0.016 | 0.020 |
| F | 1.27 | 1.52 | 0.050 | 0.060 |
| G | 2.54 BSC | | 0.100 BSC | |
| J | 0.20 | 0.30 | 0.008 | 0.012 |
| K | 3.18 | 4.06 | 0.125 | 0.160 |
| L | 15.24 BSC | | 0.600 BSC | |
| M | 0° | 15° | 0° | 15° |
| N | 0.51 | 1.27 | 0.020 | 0.050 |

CASE 623-05

NOTES:

- DIM "L" TO CENTER OF LEADS WHEN FORMED PARALLEL.
- LEADS WITHIN 0.13 mm (0.005) RADIUS OF TRUE POSITION AT SEATING PLANE AT MAXIMUM MATERIAL CONDITION. (WHEN FORMED PARALLEL).

Case 632-07 14-Pin Ceramic Dual In-Line

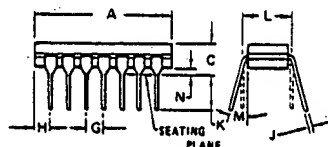


| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|-------|-----------|-------|
| | MIN | MAX | MIN | MAX |
| A | 19.05 | 19.94 | 0.750 | 0.785 |
| B | 6.10 | 7.49 | 0.240 | 0.295 |
| C | — | 5.08 | — | 0.200 |
| D | 0.38 | 0.58 | 0.015 | 0.023 |
| F | 1.40 | 1.77 | 0.055 | 0.070 |
| G | 2.54 BSC | | 0.100 BSC | |
| H | 1.91 | 2.29 | 0.075 | 0.090 |
| J | 0.20 | 0.38 | 0.008 | 0.015 |
| K | 3.18 | 4.32 | 0.125 | 0.170 |
| L | 7.62 BSC | | 0.300 BSC | |
| M | — | 15° | — | 15° |
| N | 0.51 | 1.02 | 0.020 | 0.040 |

CASE 632-07

NOTES:

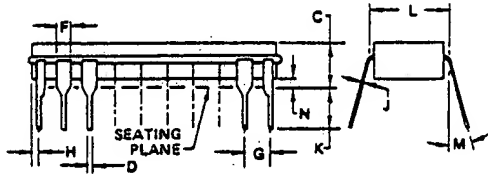
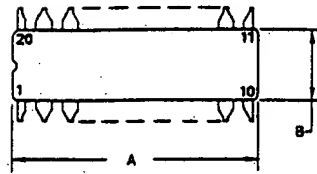
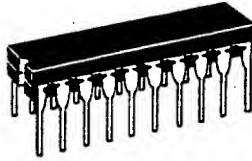
- ALL RULES AND NOTES ASSOCIATED WITH MO-001 AA OUTLINE SHALL APPLY.
- DIMENSION "L" TO CENTER OF LEADS WHEN FORMED PARALLEL.
- DIMENSION "A" AND "B" (632-07) DO NOT INCLUDE GLASS RUN-OUT.
- LEADS WITHIN 0.25 mm (0.010) DIA OF TRUE POSITION AT SEATING PLANE AND MAXIMUM MATERIAL CONDITION.



PACKAGE OUTLINES

CERAMIC DUAL IN-LINE (continued)

Case 732-03
20-Pin Ceramic Dual In-Line

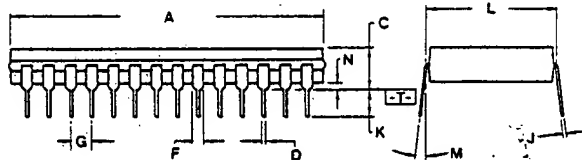
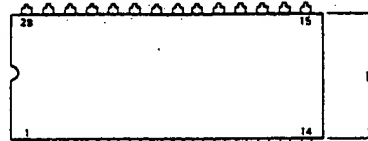
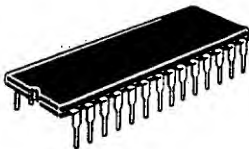


- NOTES:
- LEADS WITHIN 0.25 mm (0.010) DIA. TRUE POSITION AT SEATING PLANE, AT MAXIMUM MATERIAL CONDITION.
 - DIM L TO CENTER OF LEADS WHEN FORMED PARALLEL.
 - DIM A AND B INCLUDES MENISCUS.

| | MILLIMETERS | | INCHES | |
|-----|-------------|-------|--------|-------|
| DIM | MIN | MAX | MIN | MAX |
| A | 23.88 | 25.15 | 0.940 | 0.990 |
| B | 6.60 | 7.49 | 0.260 | 0.295 |
| C | 3.81 | 5.08 | 0.150 | 0.200 |
| D | 0.38 | 0.56 | 0.015 | 0.022 |
| E | 1.40 | 1.65 | 0.055 | 0.065 |
| F | 2.54 | 8SC | 0.100 | 8SC |
| G | 0.51 | 1.27 | 0.020 | 0.050 |
| H | 0.20 | 0.30 | 0.008 | 0.012 |
| J | 3.18 | 4.06 | 0.125 | 0.160 |
| K | 7.62 | 8SC | 0.300 | 8SC |
| L | 0° | 15° | 0° | 15° |
| M | 0.25 | 1.02 | 0.010 | 0.040 |

CASE 732-03

Case 733-02
28-Pin Ceramic Dual In-Line

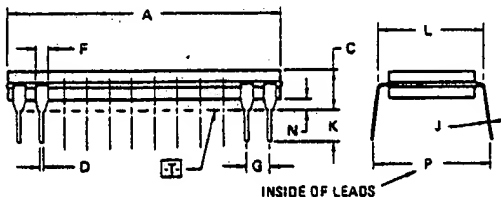
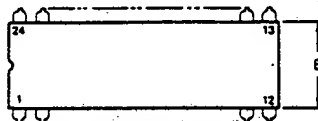
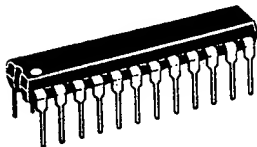


- NOTES:
- DIM [-A-] IS DATUM.
 - POSITIONAL TOL FOR LEADS:
 $\phi 0.25 (0.010) \text{ T A } \phi$
 - [-T-] IS SEATING PLANE.
 - DIM A AND B INCLUDES MENISCUS.
 - DIM L TO CENTER OF LEADS WHEN FORMED PARALLEL.
 - DIMENSIONING AND TOLERANCING PER ANSI Y14.5, 1973.

| | MILLIMETERS | | INCHES | |
|-----|-------------|-------|--------|-------|
| DIM | MIN | MAX | MIN | MAX |
| A | 36.45 | 37.85 | 1.435 | 1.490 |
| B | 12.70 | 15.37 | 0.500 | 0.605 |
| C | 4.06 | 5.84 | 0.160 | 0.230 |
| D | 0.38 | 0.56 | 0.015 | 0.022 |
| E | 1.27 | 1.65 | 0.050 | 0.065 |
| F | 2.54 | 8SC | 0.100 | 8SC |
| G | 0.20 | 0.30 | 0.008 | 0.012 |
| H | 2.54 | 4.06 | 0.100 | 0.160 |
| I | 15.24 | 8SC | 0.600 | 8SC |
| J | 0° | 15° | 0° | 15° |
| K | 0.51 | 1.27 | 0.020 | 0.050 |

CASE 733-02

Case 758-01
24-Pin Ceramic Dual In-Line



- NOTES:
- DIMENSION A IS DATUM.
 - POSITIONAL TOLERANCE FOR LEADS: 24 PLACES
 $\phi 0.25 (0.010) \text{ T A } \phi$
 - [-T-] IS SEATING PLANE.
 - DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
 - DIMENSIONING AND TOLERANCING PER ANSI Y14.5, 1973.

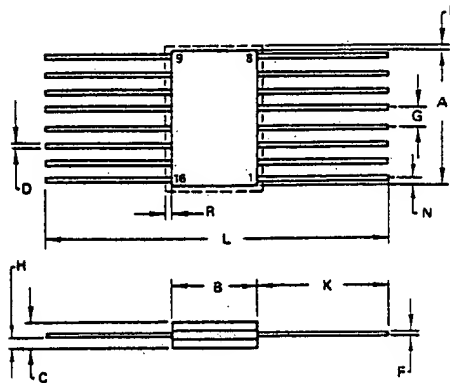
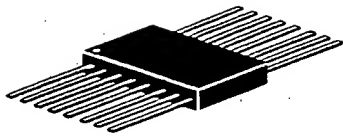
| | MILLIMETERS | | INCHES | |
|-----|-------------|-------|--------|-------|
| DIM | MIN | MAX | MIN | MAX |
| A | 31.50 | 32.64 | 1.240 | 1.285 |
| B | 7.24 | 7.75 | 0.285 | 0.305 |
| C | 3.68 | 4.44 | 0.145 | 0.175 |
| D | 0.38 | 0.53 | 0.015 | 0.021 |
| E | 1.14 | 1.57 | 0.045 | 0.062 |
| F | 2.54 | 8SC | 0.100 | 8SC |
| G | 0.20 | 0.33 | 0.008 | 0.013 |
| H | 2.54 | 4.19 | 0.100 | 0.165 |
| I | 7.62 | 7.87 | 0.300 | 0.310 |
| J | 0° | 15° | 0° | 0.050 |
| K | 9.14 | 10.16 | 0.350 | 0.400 |

CASE 758-01

PACKAGE OUTLINES

CERAMIC FLATPAK

Case 650-03
16-Pin Ceramic Flatpak



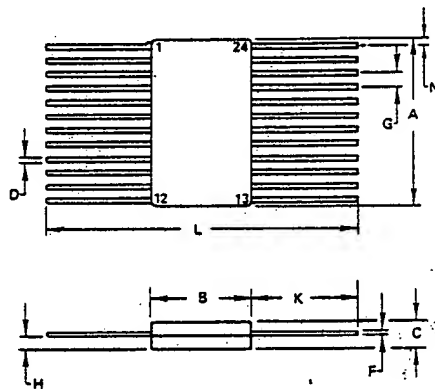
| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|-------|-----------|-------|
| | MIN | MAX | MIN | MAX |
| A | 9.40 | 10.15 | 0.370 | 0.400 |
| B | 6.22 | 7.24 | 0.245 | 0.285 |
| C | 1.52 | 2.03 | 0.060 | 0.080 |
| D | 0.41 | 0.48 | 0.016 | 0.019 |
| F | 0.08 | 0.15 | 0.003 | 0.006 |
| G | 1.27 BSC | | 0.050 BSC | |
| H | 0.64 | 0.89 | 0.025 | 0.035 |
| K | 6.35 | 9.40 | 0.250 | 0.370 |
| L | 18.92 | | 0.745 | |
| N | - | 0.51 | - | 0.020 |
| R | - | 0.38 | - | 0.015 |

CASE 650-03

NOTES:

1. LEAD NO. 1 IDENTIFIED BY TAB ON LEAD OR DOT ON COVER.
2. LEADS WITHIN 0.13 mm (0.005) TOTAL OF TRUE POSITION AT MAXIMUM MATERIAL CONDITION.

Case 652-02
24-Pin Ceramic Flatpak



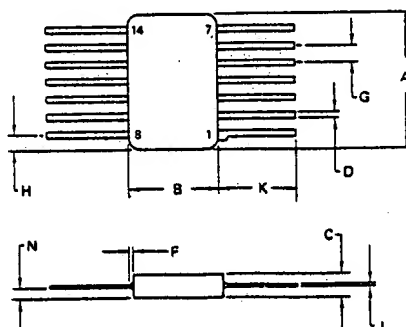
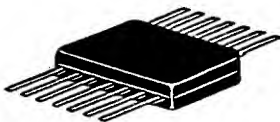
| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|-------|-----------|-------|
| | MIN | MAX | MIN | MAX |
| A | 14.99 | 15.49 | 0.590 | 0.610 |
| B | 9.27 | 9.91 | 0.365 | 0.390 |
| C | 1.27 | 2.03 | 0.050 | 0.080 |
| D | 0.38 | 0.48 | 0.015 | 0.019 |
| F | 0.08 | 0.15 | 0.003 | 0.006 |
| G | 1.27 BSC | | 0.050 BSC | |
| H | 0.63 | 1.02 | 0.027 | 0.040 |
| K | 6.35 | 9.40 | 0.250 | 0.370 |
| L | 21.97 | | 0.865 | |
| N | 0.25 | 0.63 | 0.010 | 0.025 |

CASE 652-02

NOTE:

1. LEADS WITHIN 0.25 mm (0.010) TOTAL OF TRUE POSITION AT MAXIMUM MATERIAL CONDITION.

Case 717-02
14-Pin Ceramic Flatpak



| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|------|-----------|-------|
| | MIN | MAX | MIN | MAX |
| A | - | 9.91 | - | 0.390 |
| B | - | 6.73 | - | 0.265 |
| C | - | 2.03 | - | 0.080 |
| D | 0.38 | 0.48 | 0.015 | 0.019 |
| F | - | 0.25 | - | 0.010 |
| G | 1.27 BSC | | 0.050 BSC | |
| H | 0.38 | 0.89 | 0.015 | 0.035 |
| J | 0.08 | 0.15 | 0.003 | 0.006 |
| K | - | 8.26 | - | 0.325 |
| N | 0.84 | 0.89 | 0.025 | 0.035 |

CASE 717-02

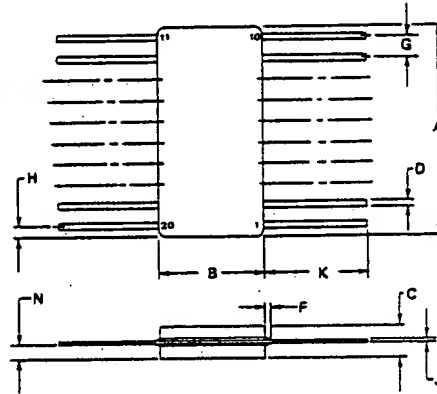
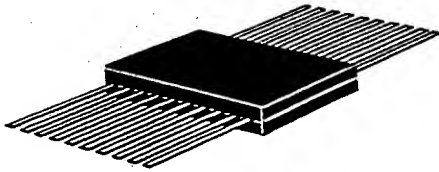
NOTES:

1. DIM "F" IS FOR GLASS OVERRUN.
2. LEADS, TRUE POSITIONED WITHIN 0.25 mm (0.010) OIA TO DIM "A" & "B" AT MAXIMUM MATERIAL CONDITION.

PACKAGE OUTLINES

CERAMIC FLATPAK (continued)

Case 737-02
20-Pin Ceramic Flatpak

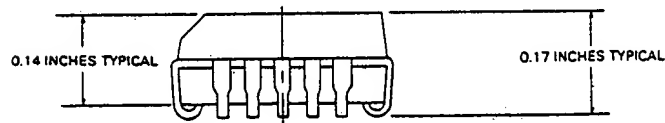
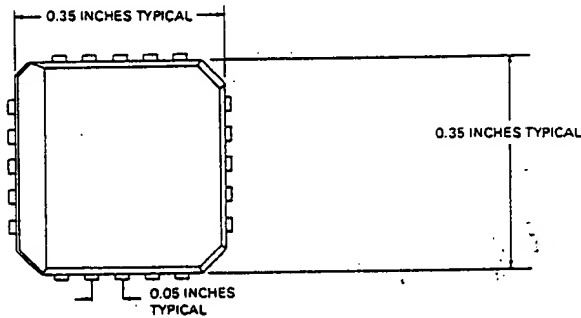


| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|-------|-----------|-------|
| | MIN | MAX | MIN | MAX |
| A | - | 13.08 | - | 0.515 |
| B | 5.84 | 7.11 | 0.230 | 0.280 |
| C | 1.52 | 2.18 | 0.060 | 0.085 |
| D | 0.41 | 0.48 | 0.016 | 0.018 |
| E | - | 0.25 | - | 0.010 |
| G | 1.27 BSC | - | 0.050 BSC | - |
| H | 1.14 | 1.40 | 0.045 | 0.055 |
| J | 0.08 | 0.13 | 0.003 | 0.005 |
| K | - | 9.14 | - | 0.360 |
| N | - | 1.02 | - | 0.040 |

CASE 737-02

NOTE:
1. LEADS WITHIN 0.25 mm (0.010)
TOTAL OF TRUE POSITION AT
MAXIMUM MATERIAL CONDITION.

QUAD PLASTIC CHIP CARRIER



9.5 HYATT V. DUDAS, 1:03-CV-00108 (EGS), MEMORANDUM OPINION
(DOCUMENT 75) (D.D.C. OCTOBER 13, 2005)

REDACTED

UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

| | | |
|--------------------------------------|---|------------------------------|
| GILBERT HYATT |) | |
| |) | |
| Plaintiff |) | |
| v. |) | Civ. Action No. 03-108 (EGS) |
| |) | |
| JON W. DUDAS, |) | |
| <i>Director of the United States</i> |) | |
| <i>Patent & Trademark Office</i> |) | |
| |) | |
| Defendant. |) | |

MEMORANDUM OPINION

Plaintiff Gilbert Hyatt is an inventor who holds more than sixty patents on subjects including microcomputers, computer memories, displays, global-positioning systems and data compression. In 1995, Hyatt filed five patent applications with defendant, the United States Patent and Trademark Office ("PTO"), all generally relating to an improved memory system for a computerized display system. See Pl.'s Mot. for Summ. J. at 3. After a lengthy appeals process, the PTO ultimately rejected plaintiff's patent applications. Plaintiff then commenced the instant action pursuant to 35 U.S.C. § 145, which provides dissatisfied applicants the right to file a civil action against the Director of the PTO in the United States District Court for the District of Columbia.

Pending before the Court are the parties' cross-motions for

summary judgment. Because this case is rife with material issues of fact, and because the administrative record has not been adequately developed, the Court will **DENY** the pending motions and **REMAND** the case to the PTO for further proceedings.

I. BACKGROUND

A. The Patent Process

One seeking to patent an invention must file a written application with the PTO. An application must include a "specification" consisting of a written description of the invention (which may include drawings) and concluding with one or more "claims" that particularly and distinctly define the subject matter the inventor regards as his or her invention. See 35 U.S.C. § 112. The claims are technically drafted and set the legal boundaries for the patent owner's exclusive rights. Claims are typically composed of multiple "elements," or physical components, and "limitations," which usually describe the claim's restrictions or interactions between features of the claim's elements.

A patent specification must contain a

written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

35 U.S.C. § 112 (emphasis added). The written description

requirement serves to "ensure that the inventor had possession, as of the filing date of the application relied on, of the specific subject matter later claimed by him." *In re Wertheim*, 541 F.2d 257, 262 (CCPA 1976). This requirement is especially relevant when, as in this case, claims are amended or added after the date of the original application. The issue then becomes whether or not the original disclosure adequately describes what is in the new claims. See, e.g., *In re Wilder*, 736 F.2d 1516 (Fed. Cir. 1984). This is a question of fact that must be determined on a case-by-case basis. See *Purdue Pharma L.P. v. Faulding Inc.*, 230 F.3d 1320, 1323 (Fed. Cir. 2000).

After an application is properly filed, a PTO examiner evaluates the application and may allow, reject, or object to the claims. See 37 C.F.R. § 1.104. At this initial step, the examiner bears the burden of producing a *prima facie* showing of the factual basis for a rejection of an application. See *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992). Following an initial rejection, the applicant may amend the claims or file an argument in reply. See 35 U.S.C. § 132. Thus, the patent applicant is generally afforded two examiner reviews of the invention proposed for patenting. If the examiner ultimately denies the application in a "Final Office Action," the applicant can appeal to the PTO's Board of Patent Appeals and Interferences ("Board"). 35 U.S.C. § 134; 37 C.F.R. § 1.191. Upon completion

of the briefing process, the Board may affirm or reverse the decision of the examiner or remand the application to the examiner for further consideration. See 37 C.F.R. § 41.50. Finally, if the claims are rejected by the Board, the applicant can directly appeal the decision to the United States Court of Appeals for the Federal Circuit, 35 U.S.C. § 141, or, as plaintiff has done here, file a civil action in the United States District Court for the District of Columbia against the Director of the PTO. See 35 U.S.C. § 145.

B. Procedural History

The procedural history of the instant case tracks the general patent application process outlined above. Plaintiff filed five patent applications in May and June 1995.¹ Each application shares the same original 517-page disclosure and contains numerous claims that are "generally related to an

¹The five applications are:

1. U.S. Patent Application Serial No. 08/436,852, "A Memory System Having Television Graphic Overlays" ("the '852 application");
2. U.S. Patent Application Serial No. 08/463,392, "An Improved Memory System Having a Scanner Input" ("the '392 application");
3. U.S. Patent Application Serial No. 08/464,084, "A Dynamic Memory System Having Adaptive Refreshing" ("the '084 application");
4. U.S. Patent Application Serial No. 08/465,291, "An Improved Output Buffer Memory System" ("the '291 application"); and
5. U.S. Patent Application Serial No. 08/461,269, "An Improved Frequency Domain System" ("the '269 application").

improved memory system for storing information" in a computer system. Pl.'s Mot. for Summ. J. at 3. At various times between January 1996 and February 1999, Hyatt cancelled all of his originally-filed claims and substituted a total of 1,120 new claims. Thus, if Hyatt can show that the later-added claims are described in his earlier-filed disclosure--that is, if Hyatt was "in possession" of these claimed inventions when the applications were filed--he is entitled to patents that relate back to the date of the original disclosures in May or early June of 1995. This is significant, as several significant changes to U.S. patent law became effective on June 8, 1995 as a result of the implementing legislation to the Uruguay Round Agreements of the General Agreement on Tariffs and Trade ("GATT"). See Uruguay Round Agreements Act, Pub. L. No. 103-465 (1994). Specifically, patents issuing from applications filed before this date receive a term of 17 years from the date of issuance, while applications filed on or after that date receive a term of 20 years from the date of filing. See Final Rule, *Changes to Implement 20-Year Patent Term and Provisional Applications*, 60 Fed. Reg. 20195 (Apr. 25, 1995); 35 U.S.C. § 154(a)(2).²

² The government contends that Hyatt was well aware of the significance of this date, as he filed [REDACTED] separate patent applications in the months preceding June 8, 1995. See Def's. Mot. for Summ. J. at 2. The government further contends that this is consistent with the tactics of so-called "submarine" applicants, who "wait[]" (like a submarine under water) for technology to develop or for some other advantageous time, and

At various times between 1997 and 1999, the PTO rejected the claims in each of the five applications, primarily for lack of sufficient written description under Section 112.³ The examiner concluded that Hyatt did not demonstrate "possession" of the claimed inventions at the time of the original filing date because he failed to point to a description in his specification that discloses how the individual components listed in the original specification could be linked to form the particular claimed devices in his amended claims. See, e.g., '852 Application, *Office Action*, 108-F-1,147 ("it is not enough that applicant show where each claimed element resides in the earliest filed application but must also provide support for the linkage of the claimed elements creating the embodiment") (emphasis in

then 'surface[]' to obtain claims to the later developed or conceived technology, arguing that it is described in their earlier-filed specification." Def's. Mem. at 3-4. Plaintiff takes issue with this characterization, arguing that there was nothing unusual or illegal in Mr. Hyatt's patent-filing practice, and claiming that the government's "character assassination" is "nothing more than a smokescreen" designed to divert the Court's attention away from the real issues in this case. See Pl's. Opp'n to Def's. Mot. for Summ. J. at 2-5.

³ Each involved application also included other claim rejections that were reversed by the Board and therefore form no part of this case. In addition to the rejections for lack of written description, there are a handful of claims in the '084 application that also stand rejected as anticipated by or obvious in view of the prior art under Sections 102 and 103, and the pending claims of the '269 application also stand rejected for lack of "enablement" under Section 112. See 108-F-1,140 to 1,155 ('852 Application); 108D-F-887 to 904 ('392 Application); 108C-F-1,010 to 1,025 ('084 Application); 108B-F-1,075 to 1,100 ('291 Application); 108E-F-730 to 750 ('269 Application).

original)).⁴

Hyatt objected to the PTO's approach, arguing primarily that the examiner failed to establish a *prima facie* case of unpatentability. However, the Board of Patent Appeals affirmed the examiner's written description rejections for each application.⁵ The Board subsequently granted plaintiffs' requests for rehearing in '852, '084, and '269, but no modifications were made to the decisions. Plaintiff then filed, pursuant to 35 U.S.C. § 145, four separate civil actions against the PTO, which were consolidated into the instant case.⁶

⁴ For each application, the examiner evaluated one claim in detail and pointed out the deficiencies in that one claim as representative of the others. See, e.g., '852 Application, *Examiner's Action*, 108-F-1,540 ("Claim 163 was chosen for it is a comprehensive claim, that is, it includes most-if not all-of the claimed elements found throughout the independent claims."). Similarly, claim 106 is treated as a representative claim in application '084; claims 105 and 86 are the representative claims for application '269; claim 58 is the representative claim for application '392; and claim 90 is the representative claim for application '291.

⁵ See Application '852 Decision on Appeal, 108-F-2,704 (sustaining examiner's Section 112 rejections, but reversing the prior art rejections); Application '392 Decision on Appeal, 108D-F-2,128 (sustaining examiner's Section 112 rejection but reversing the obviousness rejection); Application '084 Decision on Appeal, 108C-F-2,382 (affirming examiner Section 112 rejection, and reversing examiner rejection on prior art grounds with the exception of claims 191, 212, 282, 308, 260, and 304); Application '291 Decision on Appeal, 108B-F-2,558 (affirming examiner Section 112 rejection but reversing rejection for obviousness); Application '269 Decision on Appeal, 108E-F-98 (affirming examiner's Section 112 rejection).

⁶ Hyatt has filed and continues to file numerous additional cases in this Court relating to additional patent applications,

II. STANDARD OF REVIEW

This case is before the Court on the parties' cross motions for summary judgment. Pursuant to Federal Rule of Civil Procedure 56, summary judgment should be granted only if the moving party has shown that there are no genuine issues of material fact and that the moving party is entitled to judgment as a matter of law. See *Fed. R. Civ. P. 56; Celotex Corp. v. Catrett*, 477 U.S. 317, 325 (1986); *Waterhouse v. District of Columbia*, 298 F.3d 989, 991 (D.C. Cir. 2002). Likewise, in ruling on cross-motions for summary judgment, the court shall grant summary judgment only if one of the moving parties is entitled to judgment as a matter of law upon material facts that are not genuinely disputed. See *Rhoads v. McFerran*, 517 F.2d 66, 67 (2d Cir. 1975).

Finally, the "PTO is an agency subject to the Administrative Procedure Act" ("APA"), and therefore "a reviewing court must apply the APA's court/agency review standards." *Mazzari v. Rogan*, 323 F.3d 1000, 1004 (Fed. Cir. 2003). Accordingly, the Court will set aside legal actions of the Board that are "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law," and set aside factual findings that are "unsupported by substantial evidence." 5 U.S.C. § 706 (2000);

including 04-1138(HHK); 04-1139(HHK); 04-1222(EGS); 04-1496(EGS); 04-1802(HHK); 05-309(EGS); 05-310(HHK); 05-834(EGS). These cases are currently proceeding on an independent track.

Mazzari, 323 F.3d at 1005; *In re Gartside*, 203 F.3d 1305, 1316 (Fed. Cir. 2000). If the parties present additional evidence to the Court, which they may on a Section 145 review, the court must make "de novo factual findings if the evidence is conflicting." *Mazzari*, 323 F.3d at 1004; see also *Gould v. Quigg*, 822 F.2d 1074, 1077 (Fed. Cir. 1987).⁷

III. DISCUSSION

Both parties raise technical legal challenges to the other's compliance with the rules of the patent review process outlined above. For example, the parties dispute whether the PTO met its obligation to establish a *prima facie* case of unpatentability before denying Hyatt's claims. They also dispute whether Hyatt preserved his rights to argue all 1,120 claims before this Court or whether he acquiesced in litigating only five "representative" claims before the Board of Patent Appeals. Because these issues are essentially procedural in nature, the Court need not reach the merits of Hyatt's applications or the ultimate patentability of his inventions. For the same reasons, the Court need not review the PTO's "factual" determinations nor make de novo factual findings of its own at this stage of the litigation.

Although summary judgment appears to be premature at this

⁷ Although parties may present new evidence in Section 145 proceedings, they are prohibited from introducing new issues, "at least in the absence of some reason of justice put forward for failure to present the issue to the Patent Office." See *DeSeversky v. Brenner*, 424 F.2d 857, 858 (D.C. Cir. 1970).

point, the Court must resolve several threshold procedural issues and determine the proper scope and direction of this litigation. Specifically, the Court must decide three issues: 1) the scope and number of claims properly before the Court; 2) whether or not the PTO met its *prima facie* case; and 3) the remedy for any procedural failures, *i.e.* whether to proceed to a trial on the merits of Hyatt's patent applications or, instead, whether to remand to the PTO for further consideration of Hyatt's applications in the first instance.

A. Scope of Proceedings: How Many Claims are Before the Court?

Defendant argues that only five claims--rather than 1,120--are correctly before the Court. The crux of defendant's argument is that Hyatt "acquiesced in the choice of the five representative claims" before the PTO Board, and that he cannot resurrect his arguments as to the remaining 1,000+ claims. See Def.'s Mot. for Summ. J. at 18. Plaintiff argues that not only did he adequately preserve his right to argue and introduce evidence on *all* claims in the instant case, but the PTO's failure to examine each claim individually could actually be dispositive of the case, as it is evidence that the examiner did not meet its initial burden of establishing a *prima facie* case of unpatentability.

According to the Patent Act, each claim "must be considered as defining a separate invention" and "shall be presumed valid

independently of the validity of other claims." *Jones v. Hardy*, 727 F.2d 1524, 1527-28 (Fed. Cir. 1984) (citing 35 U.S.C. § 282). However, the selection and evaluation of one claim as representative in a multi-claim application is a common practice in patent litigation. For example, the PTO regulations covering appeals to the Board of Patent Appeals provide that:

[f]or each ground of rejection applying to two or more claims, the claims may be argued separately or as a group. When multiple claims subject to the same ground of rejection are argued as a group by appellant, the Board may select a single claim from the group of claims that are argued together to decide the appeal with respect to the group of claims as to the ground of rejection on the basis of the selected claim alone. Notwithstanding any other provision of this paragraph, the failure of appellant to separately argue claims which appellant has grouped together shall constitute a waiver of any argument that the Board must consider the patentability of any grouped claim separately.

37 C.F.R. § 41.37(c)(1)(vii). The former version of this regulation required an appellant to take two affirmative steps in order to assure separate review by the Board of individual claims within each group of claims subject to a common ground of rejection: "(A) state that the claims do not stand or fall together and (B) present arguments why the claims subject to the same rejection are separately patentable." See *In re McDaniel*, 293 F.3d 1379, 1383 (Fed. Cir. 2002) (citing Manual of Patent Examination Procedure ("MPEP") § 1206, and former 37 C.F.R.

§ 1.192(c)(7)(2001)).⁸ The court interpreting this rule found that it "operates to relieve the Board from having to review--and an applicant from having to argue--the myriad of distinctions that might exist among claims, where those distinctions are, in and of themselves, of no patentable consequence to a contested rejection." *McDaniel*, 293 F.3d at 1383. Defendant argues that Hyatt's arguments to the Board fail the *McDaniel* test because Hyatt failed to sufficiently explain why his claims were separately patentable.

Regardless of whether or not the "*McDaniel* test" still applies in light of the recent amendments to the PTO's regulations, the government's position that Hyatt somehow

⁸On August 12, 2004, the PTO published revised Rules of Practice adding Part 41 to Title 37 of the C.F.R. and replacing the former regulations covering ex parte appeals (37 C.F.R. §§ 1.192-196), interferences (37 C.F.R. §§ 1.601-690), and inter partes reexamination appeals (37 C.F.R. §§ 1.961-977). See Final Rule, *Rules of Practice Before the Board of Patent Appeals and Interferences*, 69 Fed. Reg. 49960 (Aug. 12, 2004).

The former 37 C.F.R. § 1.192(c)(7) read in full:

Grouping of claims. For each ground of rejection which appellant contests and which applies to a group of two or more claims, the Board shall select a single claim from the group and shall decide the appeal as to the ground of rejection on the basis of that claim alone unless a statement is included that the claims of the group do not stand or fall together and, in the argument under paragraph (c)(8) of this section, appellant explains why the claims of the group are believed to be separately patentable. Merely pointing out differences in what the claims cover is not an argument as to why the claims are separately patentable.

"acquiesced" in the litigation of only five of his 1,000+ claims is not persuasive. The record reflects plaintiff's repeated statements that his claims "do not stand or fall together." See, e.g., '852 Application, *Appeal Brief*, 108-F-1,822 (arguing that "[t]he claims do not stand or fall together" because "the claims are separately patentable and because each of the claims is separately argued"). The examiner apparently conceded this point when it acknowledged that "Appellant's brief includes a statement that the claims do not stand or fall together and provides reasons as set forth in 37 C.F.R. § 1.192 (c) (7) and (c) (8)." See '852 Application, *Examiner's Answer*, 108-F-2,303. Hyatt further restated his objections to the grouping of his claims in his Reply to the Board:

The Appellant established that the claims do not stand or fall together and the Examiner concurred therewith ... Nevertheless, the Examiner then inconsistently provides a few specific examples in support of the rejections and then rejects many claims altogether thereover. This violates the undisputed fact that the claims do not all stand or fall together.

'852 Application, *Reply Brief*, 108-F-2,341.

Despite the government's argument that Hyatt "forfeited his right" to argue his claims separately following his "strategic choice" to focus on the government's *prima facie* case, it would be unfair to foreclose plaintiff's ability to have all of his claims adjudicated on the merits before resolving the legal dispute over the *prima facie* case. Indeed, the essence of

plaintiff's argument is that it was the government's obligation, in the first instance, to separately evaluate each claim before the burden shifts back to the applicant. Accordingly, the Court must first determine whether or not the burden of production ever shifted to the applicant before deciding whether plaintiff effectively abandoned the vast majority of his claims.

B. The PTO's Prima Facie Case

While the ultimate burden of persuasion on the issue of patentability rests with the PTO, the burdens of *production* shift between the examiner and the applicant throughout the review process. See *Oetiker*, 977 F.2d at 1449 (Plager, J., concurring). The *prima facie* case is a procedural tool used at the initial stage of the examination to allocate these burdens of going forward as between the examiner and applicant. The examiner meets its *prima facie* burden by "stat[ing] clearly and specifically any objections ... to patentability," in order to "give the applicant fair opportunity to meet those objections with evidence and argument." *Id.* (explaining that this concept "serves to level the playing field and reduces the likelihood of administrative arbitrariness"). Once a *prima facie* case has been established, the burden of coming forward with rebuttal evidence shifts to the applicant. If rebuttal evidence of adequate weight is produced, the "legal inference" of the *prima facie* case is dissipated, and patentability is determined by a preponderance of

the evidence, based on the totality of the record. See *In re Piasecki*, 745 F.2d 1468, 1472 (Fed. Cir. 1984); *Oetiker*, 977 F.2d at 1445.

In this case, the parties generally dispute whether the PTO's objections at the initial examination stage were sufficient to shift the burden of production to plaintiff. The examiner's initial office action rejecting the '852 application illustrates the PTO's reasoning with respect to the written description requirement:

[The pending claims] are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

This rejection is given because the claims now present embodiments or combinations of claimed elements not disclosed in the specification at the time of filing ... it is not enough that applicant show where each claimed element resides in the earliest filed application but must also provide support for the linkage of the claimed elements creating the embodiment.

The elements of claim 163 constituting an embodiment are not specifically disclosed. While each element individually may be discussed neither the specification nor drawings clearly support the claimed embodiment as a whole. Applicant must derive support for the claimed embodiments from the earliest filed application applicant wishes to claim priority.

108-F-1,146 to -147 (emphasis in original); see also 108B-F-1,084; 108C-F-1,015; 108D-F-893.⁹ The Board's decision following

⁹ An overview of the remaining applications is set forth below:

appeal is also instructive. Using claim 163 of the '852 application as an example, the Board concluded that:

After comparing the limitations of claim 163, for example, to the disclosure, it is apparent that an "alternative" or self-contained embodiment describing each and every limitation of the claim is not set forth in the disclosure. On this basis alone, we find that the examiner had a reasonable basis for questioning the written description for each of the rejected claims on appeal, and the burden of proof thereafter shifted to appellant.

....
In the absence of a showing by appellant that rebuts the examiner's reasoning, the written description rejection of all the claims on appeal is sustained.

108-F-2,700 to -701.

Plaintiff argues that the PTO's general dismissal of his

The '291 Application. In a non-final Office Action, the PTO rejected all of the pending claims for lack of written description support. See 108B-F-1,108 to -085. This rejection mirrors that found in the '852 application. In a final action and a supplemental final action, the PTO reasserted the same rejection. See 108B-F-1,465 to -470; 108B-F-1,685 to -690.

The '084 Application. In a non-final Office Action, the PTO rejected all of the pending claims for lack of written description support. See 108C-F-1,012 to -016. This rejection mirrors that found in the '852 application. In a final action, the PTO reasserted the same rejection. See 108C-F-1,394 to -400.

The '392 Application. In a non-final Office Action, the PTO rejected all of the pending claims for lack of written description support. See 108D-F-889 to -894. This rejection mirrors that found in the '852 application. In a final action, the PTO reasserted the same rejection. See 108D-F-1,309 to -014.

The '269 Application. In a non-final Office Action, the PTO rejected all of the pending claims for lack of written description support. See 108E-F-1,377 to -378 and 1,393-1,456. In a final action, the PTO asserted essentially the same rejection. See 108E-F-1,994 and 2,002 to -082.

claims without a detailed, claim-by-claim evaluation, and specifically the Board's requirement that the applicant provide a "self-contained embodiment" in the disclosure describing each limitation of the claims, failed to satisfy the government's obligation to establish a *prima facie* case and impermissibly shifted the burden of proof from the PTO to the applicant:

Indeed, if the PTO were able to disregard with impunity the requirements of the *prima facie* case - as it has done here - and then demand that the specificity that was lacking in its *prima facie* case be foisted upon the applicant in the form of a requirement that the applicant argue each claim separately and in detail in order to preserve his appeal rights as to each claim, the PTO could force patent applicants to do the agency's work and, in the process, effectively shift the burden from PTO to the applicant.

Pl's. Opp'n to Def's. Mot. for Summ. J. at 34. Defendant responds that the examiner's initial rejections were justified because the "laundry list of computer system components" discussed in Hyatt's specification "describes only the potential of implementing a computer system in various applications," but does not describe a "precise list of interconnected components that work together in a very specific way." See Def's Mot. For Summ. J. at 31. Given the complexity of Hyatt's applications, defendant argues that

there is not much more the Examiners could have done but identify the difficulty in finding descriptions of the claimed inventions, and analyze Hyatt's responses. Hyatt was put on notice of the reasons for the written description rejection, and given an immediate opportunity to explain how the claimed inventions were, in fact, described. This is the epitome of a *prima facie* case.

However, rather than explaining where the inventions as claimed are described, Hyatt chose to argue against the sufficiency of the *prima facie* case.

Def's. Rep. at 12.

It is a close call, but given the severe consequences to the applicant should the government's arguments prevail, the Court will afford plaintiff the benefit of the doubt. Although the case law has used various expressions to set forth the standards for compliance with § 112, it is clear that the written description requirement does not require a patent applicant to provide a verbatim description of all his claims in the disclosure. See *Union Oil Co. Of Cal. v. Atl. Richfield Co.* ("UNOCAL"), 208 F.3d 989, 997-1001 (Fed. Cir. 2000). Rather, "if a person of ordinary skill in the art would have understood the inventor to have been in possession of the claimed invention at the time of filing, even if every nuance of the claims is not explicitly described in the specification, then the adequate written description requirement is met." *In re Alton*, 76 F.3d 1168, 1175 (Fed. Cir. 1996); see also *Vas-Cath, Inc. v. Mahurkar*, 935 F.2d 1555, 1563 (Fed. Cir. 1991) ("The test for sufficiency of support in a patent application is whether the disclosure of the application relied upon 'reasonably conveys to the artisan that the inventor had possession at that time of the later claimed subject matter.'" (citing *Ralston Purina Co. v. Far-Mar-Co, Inc.*, 772 F.2d 1570, 1575 (Fed. Cir. 1985))). One shows that one is "in

possession" of an invention by describing the invention with all its claimed limitations through "such descriptive means as words, structures, figures, diagrams, formulas, etc., that fully set forth the claimed invention." See *Lockwood v. Am. Airlines, Inc.*, 107 F.3d 1565, 1572 (Fed. Cir. 1997). "Although the exact terms need not be used *in haec verba*, the specification must contain an equivalent description of the claimed subject matter." *Id.*¹⁰

In this case, the PTO apparently required Hyatt to include a "self-contained embodiment describing each and every limitation of the claim" in his disclosures. See 108-F-2,700. It is difficult on this record to determine what the PTO meant by a "self-contained embodiment," or whether this requirement is consistent with the case law, because the phrase is not defined nor does it appear in any of the cases. Moreover, in rejecting plaintiff's applications, the PTO at times used rather vague and unspecific language. See, e.g., '852 Application, *Office Action*, 108-F-1,144 (describing the deficiencies in Claim 163 and then

¹⁰ Although plaintiff attempts to draw some distinctions between the cases' various expressions for compliance with § 112, see, e.g., Pl's. Reply at 9-12, the Federal Circuit has rejected this argument, stating that "[i]n all cases, the purpose of the description requirement is 'to ensure that the inventor had possession, as of the filing date of the application relied on, of the specific subject matter later claimed by him.'" See *Hyatt v. Boone*, 146 F.3d 1348, 1354 (Fed. Cir. 1998) (rejecting Gilbert Hyatt's argument that the various cases set divergent standards for compliance with § 112).

noting that "[n]umerous other claimed embodiments similarly find no clear support in the present disclosure").¹¹ Accordingly, it appears that the PTO has fallen somewhat short of its obligation to "state clearly and specifically" its objections to patentability. See *Oetiker*, 977 F.2d at 1449. Because of the risk of prejudice to plaintiff that would result from affirming the PTO's denial of his patent applications, and because the record could benefit from allowing the applicant a "fair opportunity to meet those objections with evidence and argument," the Court finds that the Board erred in determining that the examiners' rejections established a *prima facie* case.

C. What is the Remedy?

Seizing on one sentence from *Oetiker*, plaintiff argues that the examiner's failure to establish a *prima facie* case, without more, entitles Hyatt to automatic issuance of his patents. See Pl's. Reply at 4 (citing *Oetiker* for the proposition that "if the PTO fails to make its *prima facie* case, then 'without more the applicant is entitled to grant of the patent'"). However, plaintiff reads too much into *Oetiker* and appears to misunderstand the nature of the *prima facie* case. The *prima facie* case is a "purely procedural device" that allocates the burdens of production as between the examiner and the applicant. See *Piasecki*, 745 F.2d at 1471-72. The ultimate determination of

¹¹ See also 108B-F-1,081; 108C-F-1,013; 108D-F-1,722.

patentability, however, must be made on the totality of the record. In other words, the *prima facie* case is "a legal conclusion, not a fact." See *id.* at 1472; *In re Rinehart*, 531 F.2d 1048, 1052 (C.C.P.A. 1976). As Judge Plager observed in his concurring opinion in *Oetiker*:

the ultimate decision that must be made by the PTO in the examination process, and by this court on appeal, is not whether a *prima facie* case for rejection was made; the only question is whether, on the whole record, the applicant has met the statutory requirements for obtaining a patent. When a final rejection is described in terms of whether a *prima facie* case was made, that intermediate issue diverts attention from what should be the question to be decided.

Oetiker, 977 F.2d at 1449.

The Court agrees that the "intermediate issue" of the *prima facie* case has effectively diverted the attention of the parties and the Court from the actual underlying merits of plaintiff's patent applications. On this record, the Court cannot determine whether plaintiff is truly entitled to the issuance of a patent. In any event, this Court does not have the authority to direct the issuance of a patent, even where it concludes that the Board has erred as a matter of law. See *Gould v. Quigg*, 822 F.2d 1074, 1079 (Fed. Cir. 1987) (noting that 35 U.S.C. § 145 only allows the district court to *authorize*, not *direct*, the Board to issue a patent on compliance with the requirements of law). As the courts have frequently pointed out:

we pass only on rejections actually made and do not decree the issuance of patents. After our decision in an

ex parte patent case, the Patent Office can always reopen prosecution and cite new references, in which limited sense our mandates amount to remands.

In re Gould, 673 F.2d 1385, 1386 (CCPA 1982) (citing *In re Fisher*, 448 F.2d 1406, 1407 (CCPA 1971)). Accordingly, the proper remedy in this case is not the automatic issuance of a patent, as Hyatt claims, but rather the Court must decide whether to remand the case to the PTO for further proceedings or proceed independently to a determination on the merits.

This decision is influenced by the unique nature of cases under 35 U.S.C. § 145. Although it is often said that plaintiffs are entitled to *de novo* trials under § 145, these proceedings "are not true or genuine trials *de novo*," but rather have a "hybrid nature." *MacKay v. Quigg*, 641 F. Supp. 567, 569 (D.D.C. 1986). Because "the board's decision is the jurisdictional base for the suit, and the record before the office is the evidentiary nucleus," an action under § 145 "is in essence a suit to set aside the final decision of the board." *Fregeau v. Mossinghoff*, 776 F.2d 1034, 1037 (Fed. Cir. 1985); see also *Gould*, 822 F.2d at 1076. Accordingly, it is important for district courts in § 145 proceedings to have a well developed administrative record. See *Mazzari*, 323 F.3d at 1005 (noting that "[a] decision by the PTO is reviewed on the administrative record of an agency hearing provided for by statute"); *Fregeau*, 776 F.2d at 1038 ("Clearly, the applicant does not start over to prosecute his application

before the district court unfettered by what happened in the PTO."); see also *Dickinson v. Zurko*, 527 U.S. 150, 152 (1999) (holding, in a § 141 case, that the PTO is an agency subject to the familiar constraints of the Administrative Procedure Act).¹²

In this case, the parties' abstract legal dispute over the PTO's *prima facie* case has short-circuited the typical review process and left this Court without an adequate record. As a result, neither Hyatt nor the PTO have done the necessary work on the merits to enable this Court to effectively do its job under § 145. Accordingly, an order setting aside the Board's decision and remanding the case to the PTO for further proceedings is in the interests of sound judicial administration. Courts have repeatedly found remands to the PTO appropriate in § 145 and other patent adjudication cases. See *Alton*, 76 F.3d at 1175-76 (remanding to the PTO for further proceedings after finding that the examiner and Board erred as a matter of law in concluding that the applicant failed to rebut the *prima facie* case); *In re*

¹² This combination of agency review and trial-type proceedings under Section 145 raises an interesting question of the standards of review to be applied by a district court. In *Mazzari*, 323 F.3d at 1005, the Federal Circuit held that where the parties choose not to supplement the record with new evidence, the Board's factual findings are reviewed under a "substantial evidence" standard. See *id.* If, however, the parties choose to present additional evidence, the district court would make *de novo* factual findings if the evidence is conflicting. *Id.*

Beaver, 893 F.2d 329, 330 (Fed. Cir. 1989) (vacating the Board's decision for improperly grouping claims that were separately argued before the Board and remanding for decision on the merits of all the claims); *In re Gould*, 673 F.2d at 1386-87 (finding that "judicial economy dictates granting a remand" where the PTO informed the court that "several new rejections on grounds not before us are waiting in the wings"). Furthermore, the D.C. Circuit has held that courts should "abstain from consideration of an issue that has not been presented to the Patent Office." See *DeSeversky*, 424 F.2d at 859 (explaining the doctrine of exhaustion of administrative remedies in the § 145 context). Because the parties have focused exclusively on the adequacy of the *prima facie* case, they have failed to effectively address the underlying *merits* of Hyatt's patent applications. As in *DeSeversky*, "the application of Patent Office expertise in the first instance may either obviate the need for judicial consideration, or illuminate the issues and facilitate the court's disposition." *Id.* at 859. A remand will also serve the "general policy of encouraging full disclosure to administrative tribunals," see *id.* at 859 n.5, by providing applicants with incentives to begin the interactive process of patent adjudication at the outset, rather than engaging in protracted legal battles over the sufficiency of the *prima facie* case.

D. Moving Forward

The PTO understandably regards Mr. Hyatt and his numerous and complex patent applications as a significant burden and drain on its resources. See Def's. Reply at 3-4 (detailing the unusual number and complexity of Hyatt's patent applications pending before the PTO). Nevertheless, plaintiff is entitled under the law to a fair hearing and determination of his rights to a patent under the laws of the United States. See *Beaver*, 893 F.2d at 330 (noting that "[t]he public responsibility of the Patent and Trademark Office requires attentive performance of all aspects of the patent examination function"). However, plaintiff is cautioned that the PTO's obligation to establish a *prima facie* case is not necessarily a high bar. See *Alton*, 76 F.3d at 1175 (noting that "the burden placed on the examiner varies, depending upon what the applicant claims"). The PTO's Manual of Patent Examining Procedure ("MPEP")¹³ points out that:

A simple statement such as "*Applicant has not pointed out where the new (or amended) claim is supported, nor does there appear to be a written description of the claim limitation '___' in the application as filed.*" may be sufficient where the claim is a new or amended claim, the support for the limitation is not apparent, and applicant has not pointed out where the limitation is supported.

¹³ The MPEP is used by the PTO as a guide in the examination process: "While the MPEP does not have the force of law, it is entitled to judicial notice as an official interpretation of statutes and regulations as long as it is not in conflict therewith." *Molins PLC v. Textron, Inc.*, 48 F.3d 1172, 1180 n.10 (Fed. Cir. 1995).

MPEP 2163.04(I)(B). Although the examiner has the initial burden to present evidence or reasons why the written description requirement is not satisfied, the patent applicant is not entitled to sit back and let an especially complex or confusing disclosure inure to his own benefit. See *Purdue*, 230 F.3d at 1326 ("[O]ne cannot disclose a forest in the original application, and then later pick a tree out of the forest and say here is my invention.") (citing *In re Ruschig*, 379 F.2d 990, 994-95 (C.C.P.A. 1967)). The applicant is in the best position to explain his invention, especially where the claims are unusually lengthy or complex. Therefore, it is not unreasonable to expect the applicant to assist the PTO (whose resources are, after all, finite) by specifically pointing out support in the original disclosure for newly added or amended claims. See MPEP § 2163(II)(A)(3)(b) ("when filing an amendment an applicant should show support in the original disclosure for new or amended claims").

Plaintiff has made some efforts to streamline the presentation of his claims in the proceedings below. For example, following the Board's rejection of the '852 Application, plaintiff separated his claims into six categories and presented claim-by-claim arguments for the separate patentability of each appealed claim. See '852 Application Reply Brief, Exhibit 5, 108-F-2,444 to 616. Although these efforts were ultimately

rejected as untimely, see '852 Application, *Decision on Request for Rehearing*, 108-F-3,418 (noting that "a request for rehearing is not the proper vehicle to present such a showing for the first time"), they represent the types of measures that are not only possible on remand, but necessary to transform this patent adjudication into the *interactive* process it is intended to be. Accordingly, while the Court agrees that the PTO's *prima facie* case was not a model of clarity the first time around, the time has come to move past the current legal limbo and resolve the ultimate patentability of Hyatt's claims. On remand, the PTO should clearly articulate the perceived deficiencies in plaintiff's claims, and plaintiff should take every opportunity to provide evidence and argument to rebut those objections. Should this dispute eventually require further judicial intervention, at least the reviewing court will have the benefit of a fully developed record.

IV. CONCLUSION

For the reasons described above, defendant's Motion for Summary Judgment will be **DENIED**; plaintiff's Motion for Summary Judgment will be **GRANTED IN PART** with respect to the adequacy of the PTO's *prima facie* case and **DENIED IN PART** with respect to the relief requested; and this case will be **REMANDED** to the PTO for further proceedings consistent with this Memorandum Opinion.

A separate Order accompanies this Memorandum Opinion.

Signed: Emmet G. Sullivan
United States District Judge
October 13, 2005

10. RELATED PROCEEDINGS APPENDIX

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**Ex parte Hyatt, Decision on Appeal No. 1994-3042,
in patent application Serial No. 07/289,355
(PTO Bd. App. Dec. 21, 2000) (unpublished PTO decision)**

The opinion in support of the decision being entered today was not written for publication in a law journal and is not binding precedent of the Board.

Paper No. 39

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

MAILED

Ex parte GILBERT P. HYATT

DEC 21 2000

321
12/21/00

Appeal No. 1994-3042
Application No. 07/289,355

PAT. & TM. OFFICE
BOARD OF PATENT APPEALS
AND INTERFERENCES

HEARD: November 14, 2000.

Before BARRETT, FLEMING, and BARRY, Administrative Patent Judges.
BARRY, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134 from the rejection of claims 11-21. We reverse.

BACKGROUND

The invention at issue is a broadly claimed system for registering, comparing, and outputting image data. The system includes an input source for acquiring an input image and a memory for storing a reference image. A registration processor registers the input image and reference image. A comparing processor compares the registered images with each other.

Responsive to the comparison, an output device generates an output signal.

Claims 11 and 13, which are representative for our purposes, follow:

11. An image processing system comprising:
 - a [sic] input device for acquiring an input image;
 - a memory for storing a reference image;
 - a registration processor for registering the input image and the reference image;
 - a comparing processor for comparing the registered input image and reference image; and
 - an output circuit for generating an output signal in response to the comparing of the registered input image and reference image by said comparing processor.
13. The system as set forth in claim 11 above, further comprising an artificial intelligence processor for processing the output signal.¹

¹At oral hearing, the appellant was unable to identify a written description of the artificial intelligence processor in his specification (outside of the claim itself). In addition, although he mapped some of the claimed elements to his Figure 1C, (Appeal Br. at 3), the Figure shows no block labeled "artificial intelligence" or connected to the output device so as to receive the output signal.

The references relied on in rejecting the claims follow:

| | | |
|----------------------|--------------------|-----------------|
| Hobrough | 3,432,674 | Mar. 11, 1969 |
| Hemstreet | 3,713,100 | Jan. 23, 1973 |
| Nickel | 3,905,045 | Sep. 9, 1975 |
| Sacks et al. (Sacks) | 4,736,437 | Apr. 5, 1988 |
| | (effectively filed | Nov. 22, 1982). |

Claims 11-21 stand rejected under 35 U.S.C. § 103 as obvious over Sacks. Claims 11, 12, and 14-21 also stand rejected under § 103 as obvious over Hemstreet in view of Hobrough. Claim 13 also stands rejected under § 103 as obvious over Hemstreet in view of Hobrough further in view of Nickel. Rather than repeat the arguments of the appellant or examiner in toto, we refer the reader to the myriad briefs and answers for the respective details thereof.

OPINION

In deciding this appeal, we considered the subject matter on appeal and the rejection advanced by the examiner. Furthermore, we duly considered the arguments and evidence of the appellant and examiner. After considering the totality of the record, we

are persuaded that the examiner erred in rejecting claims 11-21. Accordingly, we reverse.

We begin by noting the following principles from In re Rijckaert, 9 F.3d 1531, 1532, 28 USPQ2d 1955, 1956 (Fed. Cir. 1993).

In rejecting claims under 35 U.S.C. Section 103, the examiner bears the initial burden of presenting a prima facie case of obviousness. In re Oetiker, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992).... "A prima facie case of obviousness is established when the teachings from the prior art itself would appear to have suggested the claimed subject matter to a person of ordinary skill in the art." In re Bell, 991 F.2d 781, 782, 26 USPQ2d 1529, 1531 (Fed. Cir. 1993) (quoting In re Rinehart, 531 F.2d 1048, 1051, 189 USPQ 143, 147 (CCPA 1976)).

With these principles and finding in mind, we consider the examiner's rejections over Sacks and over Hemstreet, Hobrough, and Nickel.

I. REJECTION OVER SACKS

In rejecting claims 11-21 as obvious over Sacks, the examiner makes the following assertions.

Sacks et al. disclose[s] ... a registration processor (comprising elements 10 and 18 in Fig. 1) for registering the input image and the reference image

(these elements register the input and the reference images with respect to one another as they rotate the reference [image] until it is registered in alignment with the input image, thus meeting the claim recitation); a comparing processor (comprising element 22 in Fig. 1) for comparing the registered input image and reference image (again, this limitation is met by Sacks et al., as element 22 compares the input image (from memory 20) with the reference image (from memory 16) where the images have been registered with respect to one another, where the registration has been performed by elements 10 and 18.

(Examiner's Answer at 3.) The appellant makes three arguments, which we consider seriatim.

First, the appellant argues, "Sacks is predated ... by ancestor application Serial No. 06/663,094 filed on October 19, 1984." (Appeal Br. at 7.) Sacks has an effective filing date of November 22, 1982. The appellant admits that U.S. Patent Application 06/663,094 ('094 Application) was "filed on October 19, 1984." (Appeal Br. at 7.) Because the '094 Application was filed almost two years after Sacks's effective filing date, we are not persuaded that the '094 Application predates Sacks.

Second, the appellant argues, "Sacks is predated by ancestor application Serial No. 05/550,231 now Patent No. 4,209,843 filed on February 14, 1975" His argument relies on a copendency

chain constituted by the following prior patent applications, which have issued as patents, and the instant application:

- 05/550,231 ('231 Application), which is now U.S. Patent 4,208,843 ('843 Patent)
- 06/160,872 ('872 Application), which is now U.S. Patent 4,491,930
- 06/425,731 ('731 Application), which is now U.S. Patent 4,581,715
- 06/849,243 ('243 Application), which is now U.S. Patent 5,410,621.

(Reply Br. at 4.)

The appellant fails to show a continuing disclosure of the current subject matter of claims 11-21 throughout the chain. For the instant application "to be entitled under 35 U.S.C. § 120 to the filing date of an earlier application in the chain of applications ..., it must be shown that as to the inventions claimed there has been 'continuing disclosure through the chain of applications, without hiatus.'" Lemelson v. TRW, Inc., 760 F.2d 1254, 1266-67, 225 USPQ 697, 706 (Fed. Cir. 1985) (citing In re Schneider, 481 F.2d 1350, 1356, 179 USPQ 46, 50 (CCPA 1973)). "[T]here has to be a continuous chain of copending applications each of which satisfies the requirements of §112 with respect to the subject matter presently claimed."

Schneider, 481 F.2d at 1356, 179 USPQ at 50 (citing In re deSeversky, 474 F.2d 671, 177 USPQ 144 (CCPA 1973)).

Here, the appellant attempts to show a disclosure of the limitations of claim 11 in the '843 Patent, which issued from the '231 Application. At the outset, we note that although he mapped the elements of the claim to Figure 1C of the instant application, (Appeal Br. at 3), the appellant fails to identify a corresponding figure in the Patent that looks like Figure 1C. Instead, he attempts to map elements of claim 11 to sundry portions of the Patent.

"'[T]he main purpose of the examination, to which every application is subjected, is to try to make sure that what each claim defines is patentable. [T]he name of the game is the claim'" In re Hiniker Co., 150 F.3d 1362, 1369, 47 USPQ2d 1523, 1529 (Fed. Cir. 1998) (quoting Giles S. Rich, The Extent of the Protection and Interpretation of Claims--American Perspectives, 21 Int'l Rev. Indus. Prop. & Copyright L. 497, 499, 501 (1990)). With this principle in mind, we consider the appellant's attempt to show a disclosure of the following elements of claim 11: an image processing system, an image input device, a reference image

memory, a registration processor, a comparing processor, and an output circuit in the Patent.

A. Image Processing System

"[W]hen interpreting a claim, words of the claim are generally given their ordinary and accustomed meaning, unless it appears from the specification or the file history that they were used differently by the inventor." In re Paulsen, 30 F.3d 1475, 1480, 31 USPQ2d 1671, 1674 (Fed. Cir. 1994) (citing Carroll Touch, Inc. v. Electro Mechanical Sys., Inc., 15 F.3d 1573, 1577, 27 USPQ2d 1836, 1840 (Fed. Cir. 1993)). Here, claims 11-21 specify in pertinent part the following limitations: "[a]n image processing system" Because neither the specification nor the file history defines the terms "image" or "image processing" nor suggests that the appellants sought to assign a meaning to the term different from its ordinary and accustomed meaning, that is the meaning we must give it. Those skilled in the art would have understood that an image is "[a] two-dimensional representation of a scene." The New IEEE Standard Dictionary of Electrical and Electronics Terms 617 (5th ed. 1993) (copy attached). They also would have understood that image processing

is "[t]he manipulation of images by a computer." Id. at 618 (copy attached). In view of this understanding, the limitations recite a computer for manipulating a two-dimensional representation of a scene.

The appellant fails to show a disclosure of the limitations in the '843 Patent. Attempting to show such a disclosure, he cites the following portions of the Patent: "columns 1: 33-38, 34:36-37, 39:54-56, and 76:58-62; system 500 in Figs. 5A-5B and columns 56:38-76:36; system 600 in Fig 6D and columns 83:65-106:36 and CRT display in Fig. 6H and columns 114:54-116:15" (Appeal Br. at 7.) At the outset, we note the examiner's uncontested finding that "the only patent that contained any reference to 'image processing' or an 'image processor' was Patent Number 4,954,951." (Supplemental Examiner's Answer at 10.) For our part, we find that the application corresponding to U.S. Patent No. 4,954,951 ('951 Patent) is not even in the appellant's aforementioned chain of applications. With these findings in mind, we consider portions of the '843 Patent cited by the appellant.

Rather than relating its invention to image processing, the '843 Patent explains that the "invention relates to signal processing arrangements and, in particular, to digital filtering arrangements." Col. 1, ll. 35-38. Figures 5A and 5B of the '843 Patent merely depict "correlator and compositor operations" Col. 4, ll. 44-45. Similarly, Figure 6D simply "shows a detailed control logic and correlator arrangement" Col. 4, ll. 58-60. The appellant does not show that the correlator, compositor, and correlator operations constitute a computer for manipulating a two-dimensional representation of a scene.

The '843 Patent mentions that "[f]iltered signals 117 may be provided to output device 118 which may include a CRT display ...", col. 34, ll. 36-37, and adds that "[i]n an acoustic imaging system, output devices 118 may include a CRT display for displaying acoustic images" Col. 39, ll. 54-56. The Patent reveals that "[p]roduct signal 612 ... may be used to update signal samples ... for a memory output device or to modulate the Z-axis signal of a CRT display" Col. 76, ll. 58-62. The Patent generally discusses "an output display arrangement ...", col. 114, ll. 55-57, and specifically "shows a CRT display arrangement." Col. 4, l. 65 (describing Fig. 6H.) Because

merely displaying data on a CRT or storing data in a memory does not rise to the level of manipulating a two-dimensional representation of a scene, even if the data represent acoustic images, we are not persuaded that the '843 Patent discloses the limitations of "[a]n image processing system"

B. Image Input Device

Claims 11-21 further specify in pertinent part the following limitations: "a [sic] input device for acquiring an input image" Accordingly, the limitations require inputting an image. The appellant fails to show a disclosure of the limitations in the '843 Patent. Attempting to show such a disclosure, he cites the following portions of the Patent: "elements 510-511 in Fig 5A; element 623 in Fig 5D [sic] and column 85:7-11" (Appeal Br. at 7.)

At the outset, we note the examiner's uncontested finding that "only patent number 4,954,951 had any extensive discussion of actual image data or any processing of the images. The other three references only had a brief ... mention of including 'a CRT display for displaying acoustic images'" (Supplemental

Examiner's Answer at 11.) We recall our finding that the application corresponding to the '951 Patent is not in the appellant's aforementioned chain of applications. With these findings in mind, we consider portions of the '843 Patent cited by the appellant.

Step 510 of Figure 5A of the '843 Patent depicts "ENTER[ING] ROUTINE." The routine is "[t]he software embodiment of the correlator algorithm" Col. 59, ll. 34-36. Accordingly, the Step does not input any data, let alone an image. Step 511 of the same Figure portrays "LOAD[ING] PILOT SAMPLES INITIALIZE: SAMPLE 0=>L PILOT 0=>Jo." The appellant fails to explain how the Step inputs an image. Figure 5D is absent from the Patent. Although the Patent mentions that "[a] trace signal sample T_L may be accessed in real-time as it becomes available for processing with squaring amplifier 623," col. 85, ll. 7-11, the appellant does not show that the trace signal sample is an image. Accordingly, we are not persuaded that the '843 Patent discloses the limitations of "a [sic] input device for acquiring an input image"

C. Reference Image Memory

Claim 11 further specifies in pertinent part the following limitations: "a memory for storing a reference image" Accordingly, the limitations require storing a reference image. The appellant fails to show a disclosure of the limitations in the '843 Patent. Attempting to show such a disclosure, he cites the following portions of the Patent: "element 511 in Fig 5A; element 542 in Fig 5B and column 73:44-73:64; P-ROM 625 in Fig 5D and columns 84:42-45, 85:11-12, and 90:66-91:21" (Appeal Br. at 7.)

At the outset, we recall the examiner's uncontested finding that "only patent number 4,954,951 had any extensive discussion of actual image data or any processing of the images. The other three references only had a brief ... mention of including 'a CRT display for displaying acoustic images" (Supplemental Examiner's Answer at 11.) We also recall our finding that the application corresponding to the '951 Patent is not in the appellant's aforementioned chain of applications. With these findings in mind, we consider portions of the '843 Patent cited by the appellant.

As mentioned regarding the image input device, Step 511 of Figure 5A of the '843 Patent portrays "LOAD[ING] PILOT SAMPLES INITIALIZE: SAMPLE 0=>L PILOT 0=>Jo." As also aforementioned, the appellant fails to explain how the Step inputs an image. His citation of the same Step as also disclosing the storing of a reference image is obfuscating; he fails to explain how the Step inputs an image or stores a reference image or both.

Step 542 in Figure 5B of the Patent depicts "ACCESS[ING] P_j , T_L ." The Patent mentions that "signal samples such as the pilot signal samples P_j , ... may be accessed from a ... memory" Col. 73, ll. 44-64. It reveals that "[p]ilot signal P_j may be accessed from P-ROM 625 ...", col. 85, ll. 11-12; describes "selecting the appropriate pilot signal sample P_j from P-ROM 625", col. 84, ll. 42-45; and explains that "P-ROM 625 may be accessed ... to define sequential samples P_j of the pilot signal" Col. 90, ll. 66-68. Because the appellant does not show that the pilot signal samples comprise an image, let alone an image used for reference, we are not persuaded that the '843 Patent discloses the limitations of "a memory for storing a reference image"

D. Registration Processor

Claims 11-21 further specify in pertinent part the following limitations: "a registration processor for registering the input image and the reference image" At oral hearing, the appellant admitted that he did not define the term registration in his specification. Instead, he adopted the following definition of registration, which was provided by the examiner.

"[R]egistration" is an image processing technique that involves the manipulation of one or both of the input and reference images by a particular process, including rotation, translation and scaling of the image data so that the two images are aligned to one another in space, size and orientation. Also, the term "registration" has particular meaning in the image processing art, and this meaning is more than simple "synchronization" and is actually more in line with the processes recited in claims 15-21.

(Supplemental Examiner's Answer at 15.) According to the definition, the limitations require more than synchronization. The limitations instead require manipulating the input image, the reference image, or both, by a particular process including rotation, translation, and scaling so that the two images are aligned in space, size, and orientation.

The appellant fails to show a disclosure of the limitations in the '843 Patent. Attempting to show such a disclosure, he refers to the Patent's "synchronizing" (Appeal Br. at 7.) Specifically, he cites the synchronizing "with elements 501-503, 512, 518, 520, 525, and 527 in Fig 5A and columns 58:7-58:43 and 61:25 et seq; elements 540, 544, 546, and 548 in Fig 5B and column 74:14 et seq; element 624, counters 616-619, signal NXT, and signal CRT SYNC in Fig 5D and columns 84:9-41, 85:49-86:12, and 86:29 et seq" (Id. at 8.)

At the outset, we note the examiner's uncontested finding that the '843 Patent omits "the term 'registration.'" (Supplemental Examiner's Answer at 11.) We also note the examiner's uncontested finding the three other reviewed patents use the term "only in a mention of a related application that uses this word in the title. There is no other mention of any registration. Nor is there any mention in any of the references of the term 'registering'." (Id.) We observe that because the appellant has not shown a disclosure in the '843 Patent of an input image or a reference image as aforementioned, the Patent cannot disclose registration of the two images. With these

findings and observation in mind, we consider portions of the '843 Patent cited by the appellant.

The '843 Patent mentions that "[t]he flow diagram set forth in FIG. 5A represents a real-time correlation algorithm for a plurality of input trace signals processed in a time-shared manner. A plurality of iterative loops are provided to process each sample for each trace signal" Col. 58, ll. 7-11. The Patent adds the following description.

Inner loop 503 iteratively processes a particular trace signal sample T_{LN} with each of the pilot signal samples P_j to update the output signal samples Z_k for the particular channel N. Middle loop 502 sequences across a plurality of trace signal channels N to obtain a trace signal T_L from each of the plurality of trace signals for a substantially constant sample time; wherein each spacial-domain sample across the array of trace signals is iteratively processed with the appropriate pilot signal samples P_{jN} with inner loop 503.

Col. 58, ll. 13-22. In addition, it adds the following explanation.

The correlation program may be synchronized with the input trace signal, where synchronization may be performed with a sync pulse tested in operation 512. If a sync pulse is not detected, the program may loop back around test 512 as a delay until a sync pulse is detected. When a sync pulse is detected in operation 512, the program will branch to outer loop routine 501 to process the trace signal samples. In one embodiment, the sync pulse may be received as a

discrete input (DI) detected with a skip-on-discrete (SD) instruction in operation 512. If the discrete sync pulse is not detected, the program will execute a transfer (TR) instruction following the SD-instruction which will loop back along the NO path to wait for a sync pulse. If a sync pulse is detected with an SD-instruction, the program will skip over the transfer instruction and follow the YES path to commence with the processing of trace signal samples.

Col. 61, ll. 26-33. The appellant fails to show that synchronizing the correlation program with the input trace signal constitutes registering the input image and the reference image. The claimed limitations require more than synchronization.

The '843 Patent also mentions testing a K-parameter "to see if $K = K_{max}$ " Col. 74, ll. 14-15. The appellant's reliance on the testing is unclear. Although the Patent teaches that "[a] synch signal may be used to initiate a correlation operation," col. 84, ll. 25-26; that "[c]orrelation may be initiated with a synch pulse to AND-gate 638, id. at ll. 25-26; and that "[t]he synch signal initiates a correlation operation," col. 86, ll. 1-2, the appellant fails to show that initiating a correlation program is tantamount to registering the input image and the reference image. Again, the claimed limitations require more than synchronization. Accordingly, we are not persuaded that the '843 Patent discloses the limitations of "a registration

processor for registering the input image and the reference image
...."

E. Comparing Processor

Claims 11-21 further specify in pertinent part the following limitations: "a comparing processor for comparing the registered input image and reference image" At oral argument, the appellant explained that the input image and reference image are compared to each other. Accordingly, the limitations require a comparing processor for comparing the registered input image and reference image with each other.

The appellant fails to show a disclosure of the limitations in the '843 Patent. Attempting to show such a disclosure, he refers to the Patent's "correlator processor" (Appeal Br. at 8.) Specifically, he cites "element 517 in Fig 5A and columns 58:7 et seq and 61:9-24; element 543 in Fig 5B and columns 73:65 et seq; and element 626 in Fig 5D and columns 84:6 et seq and 91:53-94:3" (Id.)

At the outset, we note the examiner's uncontested finding that "[w]hile 'comparing' and 'correlation' are similar processes, they are not the same" (Supplemental Examiner's Answer at 16.) We observe that because the appellant has not shown a disclosure in the '843 Patent of an input image, a reference image, or registration of the two images as aforementioned, the Patent cannot compare the two registered images. With this findings and observation in mind, we consider portions of the '843 Patent cited by the appellant.

As aforementioned, the '843 Patent describes a correlation algorithm including a plurality of iterative loops. Cols. 58, 61, and 84. The appellant fails to explain the algorithm shows a comparing processor for comparing the registered input image and reference image with each other. In describing its Figure 5B, the Patent teaches "adding the product $T_i \cdot P_j$ to the Z_k sample as shown in the operation 543." Col. 73 ll. 67-68. It is unclear how this addition and multiplication constitutes a comparing.

Although the '843 Patent mentions that "[e]xclusive-OR circuit 626 compares a trace signal sample T_i with a pilot signal sample P_j ," col. 91 ll. 53-54, the circuit is not a processor.

The appellant also fails to show that comparing the trace signal sample with the pilot signal sample is tantamount to comparing the registered input image and reference image with each other. Accordingly, we are not persuaded that the '843 Patent discloses the limitations of "a comparing processor for comparing the registered input image and reference image"

F. Output Circuit

Claims 11-21 further specify in pertinent part the following limitations: "an output circuit for generating an output signal in response to the comparing of the registered input image and reference image by said comparing processor." Accordingly, the limitations require generating an output signal responsive to the comparing of the registered input image and reference image by the comparing processor.

The appellant fails to show a disclosure of the limitations in the '843 Patent. Attempting to show such a disclosure, he cites "elements 525-526 in Fig 5A; signals UPD to CRT Z-AXIS and NXT CRT SYNC in Fig 5D [sic] and column 85:30-48 and CRT

circuitry in Fig. 6H and columns 158:49-161:60" (Appeal Br. at 8.)

At the outset, we observe that because the appellant has not shown a disclosure in the '843 Patent of an input image, a reference image, registration of the two images, or comparison of the two registered images, the Patent cannot perform any operations responsive to the comparing of the registered input image and reference image. With this observation in mind, we consider portions of the '843 Patent cited by the appellant.

Step 525 of Figure 5A of the '843 Patent depicts testing whether $L=L_{max}$; Step 526 of the same Figure shows "EXIT[ING] ROUTINE." The routine is "[t]he software embodiment of the correlator algorithm" Col. 59, ll. 34-36. Accordingly, the Steps do not output any signal. As mentioned regarding the input device, furthermore, Figure 5D is absent from the Patent.

The Patent mentions that "[o]utput signal samples Z_k are accessed from Z-RAM", col. 85, l. 30. It also mentions "[t]he use of a CRT display for the output device", col. 158, ll. 64-65, and "shows a CRT display arrangement" in its Figure 6H. Col. 4,

1. '65. The appellant does not show that the data are displayed or accessed, however, in response to the comparing of a registered input image and reference image. Similarly, he fails to show that the update command signal (UPD) generated by the Patent's Z-counter 613 or the NXT CRT SYNC signal generated by K-counter 619 are generated responsive to the comparing of a registered input image and reference image. Accordingly, we are not persuaded that the '843 Patent discloses the limitations of "an output circuit for generating an output signal in response to the comparing of the registered input image and reference image by said comparing processor."

In addition to finding his attempt to show a disclosure of the elements of claim 11 in the '842 Patent unpersuasive, we note that the appellant does not attempt to show a disclosure of the limitations of claim 11 in either the '872 Application, the '731 Application, or the '243 Application. We also note that he further neglects to attempt to show a disclosure of the limitations of claims 12-21 in any of the prior applications. For the foregoing reasons, we are not persuaded that the instant application is entitled to the filing date of either the '231

Application, the '872 Application, the '731 Application, or the '243 Application.

Third, the appellant argues, "Sacks teaches reading out or searching of a scan line ... not the claimed comparing of images." (Reply Br. at 8.) As mentioned regarding the second argument, claims 11-21 specify in pertinent part the following limitations: "a comparing processor for comparing the registered input image and reference image; an output circuit for generating an output signal in response to the comparing of the registered input image and reference image by said comparing processor." Accordingly, the limitations require a comparing processor for comparing the input image and the reference image after the images have been registered and an output circuit responsive to the comparison of the registered images.

The examiner fails to show a suggestion of the limitations in the prior art. Sacks discloses "a high speed pattern recognizer ... for storing a known scene and then searching an unknown scene to determine the coordinates of the best possible match in the shortest period of time." Col. 1, ll. 9-13. In other words, the pattern recognizer performs image registration

of the known and unknown scenes. Although the pattern recognizer "continuously compares the video information from the scene being searched from video memory 20 against the stored data from the reference memory 16," col. 6, ll. 40-43, the comparison is not performed after the video information and the stored data have been registered. To the contrary, the comparison is part of its overall image registration.

The reference teaches that "[p]attern recognizers have wide applicability in industry in such diverse fields as automatic alignment, inspection, manufacturing, counting and identification, just to name a few. The pattern recognizer has the ability to automatically recognize and inspect parts and control remote manufacturing operations and without the need of human intervention." Col. 1, ll. 14-20. Although this teaching suggests application of Sack's pattern recognizer to diverse fields, the examiner does not propose combining Sacks with a reference that teaches performing a comparison and an output responsive to a registration.

Because Sacks performs comparison as part of its overall image registration, we are not persuaded that teachings from the

prior art would have suggested the limitations of "a comparing processor for comparing the registered input image and reference image; an output circuit for generating an output signal in response to the comparing of the registered input image and reference image by said comparing processor." Therefore, we reverse the rejection of claims 11-21 as obvious over Sacks. We end by considering the examiner's rejections over Hemstreet, Hobrough, and Nickel.

II. REJECTION OVER HEMSTREET, HOBROUGH, AND NICKEL

The examiner concludes "it would have been obvious ... to perform the various registration processes of Hobrough in the system of Hemstreet because of the conventionality of performing registration of two images with respect to one another (which is performed by both references) and because Hemstreet already recognizes the desirability and necessity of assuring that the two sets of image data are registered for proper comparison processing and for properly determining if the two images are the same." (Supplemental Examiner's Answer at 4-5.) The appellant argues, "this new 35 USC 103 rejection is clearly based upon improper hindsight, guided by the instant disclosure and claims

and not by motivation in the prior art." (Supplemental Reply Br. at 3.)

As mentioned regarding the rejection over Sacks, claims 11-21 specify in pertinent part the following limitations: "a registration processor for registering the input image and the reference image" Accordingly, the claims require registering an input image and a reference image.

The examiner fails to show a suggestion of the limitations in the prior art. "Obviousness may not be established using hindsight or in view of the teachings or suggestions of the inventor." Para-Ordnance Mfg. v. SGS Importers Int'l, 73 F.3d 1085, 1087, 37 USPQ2d 1237, 1239 (Fed. Cir. 1995) (citing W.L. Gore & Assocs., Inc. v. Garlock, Inc., 721 F.2d 1540, 1551, 1553, 220 USPQ 303, 311, 312-13 (Fed. Cir. 1983)). "It is impermissible to use the claimed invention as an instruction manual or 'template' to piece together the teachings of the prior art so that the claimed invention is rendered obvious." In re Fritch, 972 F.2d 1260, 1266, 23 USPQ2d 1780, 1784 (Fed. Cir. 1992) (citing In re Gorman, 933 F.2d 982, 987, 18 USPQ2d 1885, 1888 (Fed. Cir. 1991)). "[T]he question is whether there

is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination.'" In re Beattie, 974 F.2d 1309, 1311-12, 24 USPQ2d 1040, 1042 (Fed. Cir. 1992) (quoting Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co., 730 F.2d 1452, 1462, 221 USPQ 481, 488 (Fed. Cir. 1984)).

Here, Hemstreet addresses "comparison of a sample with one or many patterns already recorded in [a] memory device" Col. 4, ll. 7-9. The examiner admits that the reference "does not explicitly address" (Supplemental Examiner's Answer at 3) "the limitation in claim 11 directed to 'a registration processor for registering the input image and the reference image'" (Id.) Although Hemstreet mentions that its "scanning beam must be kept in accurate synchronism with the rotation of the magnetic drum," col. 9, ll. 2-4, the examiner further admits, "the term 'registration' ... is more than simple 'synchronization'" (Supplemental Examiner's Answer at 15.)

Although Hobrough teaches "automatic registration of photographic images," col. 3, ll. 49-50, the examiner fails to identify a sufficient suggestion to add the automatic

registration of Hobrough to the system of Hemstreet. There is no evidence that the sample and the patterns to be compared in Hemstreet are misregistered so as to benefit from registration. To the contrary, the "letter S and the numeral 5 to be compared with each other," col. 8, ll. 43-45, appear to feature the same scaling and rotation. See Fig. 7.

Relying on Nickel to show a "'general purpose computer'" (Supplemental Examiner's Answer at 8), the examiner fails to allege, let alone show, that the reference cures the deficiency of Hemstreet and Hobrough.² Because there is no evidence that registration would have been desirable in Hemstreet, we are not persuaded that teachings from the prior art would have suggested the limitations of "a registration processor for registering the input image and the reference image" Therefore, we reverse the rejection of claims 11, 12, and 14-21 as obvious over Hemstreet in view of Hobrough is reversed and the rejection of claim 13 as obvious over Hemstreet in view of Hobrough further in view of Nickel.

²At oral hearing, the examiner invited the Board to consider Nickel as an anticipatory reference. No such rejection, however, is before us. We leave it to the examiner to decide whether to make an anticipation rejection based on the reference.

CONCLUSION

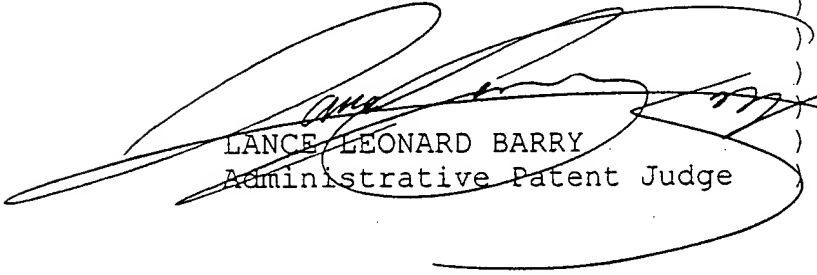
In summary, the rejection of claims 11-21 under 35 U.S.C. § 103 as obvious over Sacks is reversed. The rejection of claims 11, 12, and 14-21 under § 103 as obvious over Hemstreet in view of Hobrough is also reversed. In addition, the rejection of claim 13 under § 103 as obvious over Hemstreet in view of Hobrough further in view of Nickel is reversed.

REVERSED



MICHAEL R. FLEMING
Administrative Patent Judge

) BOARD OF PATENT
) APPEALS
) AND
) INTERFERENCES



LANCE LEONARD BARRY
Administrative Patent Judge

BARRETT, Administrative Patent Judge, concurring.

I join the opinion authored for the Board by Administrative Patent Judge (APJ) Barry. In my opinion, the claimed subject matter is not patentable, but I agree with APJ Barry that the Examiner's rejections fail to establish a prima facie case of obviousness over the prior art and that it is not our responsibility to make rejections in the first instance. I write separately to state my views on several issues I consider important, and to provide guidance to the Examiner.

No shift in inventions is allowed.

There are 93 continuations of the present application, all filed before June 8, 1995. Any patent issued on these applications will have a 17 year term from the date of grant, since it is greater than 20 years from date of filing. 35 U.S.C. §§ 154(a)(2), 154(c). Appellant has a duty to maintain a clear line of demarcation between the inventions in these various applications. See 37 CFR § 1.78(b); Manual of Patent Examining Procedure § 822 (7th ed., Rev. 1, Feb. 2000). The present invention is directed to registration of an input image with a reference image followed by comparison of the registered image input image and the reference

image. The present application may not be amended to shift to another invention.

The invention

Appellant refers to figure 1C for a block diagram of the image processing system (Brief, p. 3). While I have not reread the specification several times, as would be needed to glean every detail, it seems to me that the claimed invention is best described at pages 493-502 of the specification.

Level of skill in the art

The references are generally the best and only evidence of the level of ordinary skill in the art. See In re Oelrich, 579 F.2d 86, 91, 198 USPQ 210, 214 (CCPA 1978) ("the PTO usually must evaluate both the scope and content of the prior art and the level of ordinary skill solely on the cold words of the literature"); In re GPAC Inc., 57 F.3d 1573, 1579, 35 USPQ2d 1116, 1121 (Fed. Cir. 1995) (the Board did not err in adopting the approach that the level of skill in the art was best determined by the references of record).

Obviousness is determined through the eyes of one of ordinary skill in the art. 35 U.S.C. § 103(a). One of ordinary skill in the art must be presumed to know something about the art apart from

what the references expressly disclose. In re Jacoby, 309 F.2d 513, 516, 135 USPQ 317, 319 (CCPA 1962); In re Oetiker, 977 F.2d 1443, 1447-48, 24 USPQ2d 1443, 1446-47 (Fed. Cir. 1992) (Nies, C.J., concurring). Skill in the art must be presumed. In re Sovish, 769 F.2d 738, 743, 226 USPQ 771, 774 (Fed. Cir. 1985). I find, based on the references, that the level of ordinary skill in the image processing and pattern recognition art was high at the time the invention was made. Therefore, it is fair to infer that operations described in a reference could have been implemented by one having ordinary skill in the art.

The hypothetical person of ordinary skill does not have to be a single, real person, but may be a person skilled in several arts related to the invention, such as pattern recognition and computer programming. Cf. In re Naquin, 398 F.2d 863, 866, 158 USPQ 317, 319 (CCPA 1968) (discussing enablement, which is judged by the person ordinary skill: "When an invention, in its different aspects, involves distinct arts, that specification is adequate which enables the adepts of each art, those who have the best chance of being enabled, to carry out the aspect proper to their specialty."); In re Brown, 477 F.2d 946, 950, 177 USPQ 691, 694 (CCPA 1973) (standard is person skilled in both art of navigation systems and art of programming digital computers).

Official Notice

Official Notice³ may be considered related to the findings of content of the prior art (what was known in the art) and/or the level of ordinary skill in the art (the abilities of one of ordinary skill in the art). Official Notice should not be used except where the proposition at issue is supported by common knowledge or capable of unquestionable demonstration. See In re Knapp-Monarch Co., 296 F.2d 230, 232, 132 USPQ 6, 8 (CCPA 1961). See also In re Cofer, 354 F.2d 664, 668, 148 USPQ 268, 271-72 (CCPA 1966). Cf. In re Eynde, 480 F.2d 1364, 1370, 178 USPQ 470, 474 (CCPA 1973) (court will not take judicial notice of the state of the art). "Assertions of technical facts in areas of esoteric technology must always be supported by citation to some reference work recognized as standard in the pertinent art" In re Ahlert, 424 F.2d 1088, 1091, 165 USPQ 418, 420 (CCPA 1970); accord In re Pardo, 684 F.2d 912, 917, 214 USPQ 673, 677 (CCPA 1982). For a discussion of Official Notice, which is informative, but is not formally citeable (because it is designated as

³ The Examiner take "Judicial Notice" of certain facts. See Examiner's Answer, pp. 4 and 5. "Judicial Notice" is for the courts; "Official Notice" is used by administrative agencies, such as the U.S. Patent and Trademark Office.

unpublished), see In re Sun, 31 USPQ2d 1451, 1454-55 (Fed. Cir. 1993) (unpublished).

I believe the Examiner should provide a reference instead of relying on Official Notice. While I agree that artificial intelligence, spatial filters, and registration processes per se were known, as asserted by the Examiner at pages 4-5 of the Examiner's Answer, these are technical facts that are not within common knowledge. Our reviewing court, the U.S. Court of Appeals for the Federal Circuit, has no way of verifying those facts from the record; our assertions are not evidence. In addition, that a fact may be well known, and, therefore, susceptible to a finding of Official Notice, does not itself provide the motivation for the combination. For example, just because artificial intelligence was a known concept in the art, as stated in the Final Rejection (Paper No. 12, p. 4), does not provide the motivation to use an artificial intelligence processor as recited in claim 13. On the other hand, given the broad disclosure of using an artificial intelligence processor, a general teaching of using an artificial intelligence processor in pattern recognition would provide the necessary motivation for use in the implied pattern recognition environment of the claims. Similarly, a general teaching of comparing using a spatial filter in a pattern recognition environment would provide

the necessary motivation for the spatial filter of claims 15 and 16.

Consider Appellant's disclosure

The Examiner should consider Appellant's disclosure in determining such issues as enablement of references, the level of skill in the art, the known content of the prior art, and the amount of evidence needed to establish the obviousness of the claimed subject matter imitations. A reference need not provide any more detail than applicant's specification. That is, where the reference's disclosure is of comparable scope to Appellant's disclosure, it must be assumed that a person of ordinary skill in the art possessed the necessary materials, equipment, knowledge, and design skills to make and use the claimed subject matter or Appellant's own specification would be non-enabling. See In re Epstein, 32 F.3d 1559, 1568, 31 USPQ2d 1817, 1823 (Fed. Cir. 1994) ("Rather, the Board's observation that appellant did not provide the type of detail in his specification that he now argues is necessary in prior art references supports the Board's finding that one skilled in the art would have known how to implement the features of the references and would have concluded that the reference disclosures would have been enabling."); In re Fox,

471 F.2d 1405, 1407, 176 USPQ 340, 341 (CCPA 1973) (appellant's specification "assumes anyone desiring to carry out the process would know of the equipment and techniques to be used, none being specifically described"); Constant v. Advanced Micro-Devices, Inc., 848 F.2d 1560, 1569, 7 USPQ2d 1057, 1063 (Fed. Cir. 1988) ("The disclosure in Exhibit 5 is at least of the same level of technical detail as the disclosure in the '491 patent. If disclosure of a computer program is essential for an anticipating reference, then the disclosure in the '491 patent would fail to satisfy the enablement requirement of 35 U.S.C. § 112, First ¶.").

A concrete example of the principle in the preceding paragraph is the recitation of "an artificial intelligence processor for processing the output signal" in claim 13. At the oral hearing, the Examiner provided a listing of all occurrences of the term "artificial intelligence" in the specification: pages 22, 30, 64, 493, and 495. These portions of the specification say no more than that the processed information can be routed to an artificial intelligence processor (page 22) or can be used in artificial intelligence applications (page 493), without any details of the artificial intelligence processor, its operation, or construction. Thus, it is only necessary to find an artificial intelligence processor in combination with some sort of image matching system,

e.g., robot vision, inspection, etc., to meet this limitation. The Examiner correctly notes that the term "artificial intelligence" is broad. In my opinion, almost any kind of decision-making or recognition algorithm could be broadly considered a form of artificial intelligence.

Prior art

As a result of a limited prior art search, I bring the following references to the attention of the Examiner and Appellant. Copies are attached.

Nagy, Digital Image-Processing Activities in Remote Sensing for Earth Resources, Proc. IEEE, Vol. 60, October 1972, pp. 1177-1200, reprinted in Machine Recognition of Patterns (Ashok K. Agrawala ed., IEEE Press 1976), pp. 381-404 (page references will be to pages of reprint) (library call number Q 327 M3).

Anuta (Anuta I), Digital Registration of Multispectral Video Imagery, SPIE Journal, Vol. 7, No. 6, Sept. 1969, pp. 168-175 (copy attached).

Anuta (Anuta II), Spatial Registration of Multispectral and Multitemporal Digital Imagery Using Fast Fourier Transform Techniques, IEEE Trans. Geo. Elec., Vol. GE-8, No. 4, October 1970, pp. 353-368.

Fu et al. (Fu), Information Processing of Remotely Sensed Agricultural Data, Proc. IEEE, Vol. 57, No. 4, April 1969, pp. 639-653.

Claim 11 calls for registration of an input image with a reference image followed by comparison of the registered image input image and the reference image. Nagy discloses (p. 390):

The need for exact (element-by-element) superimposition of two images of the same scene upon one another arises in the preparation of color composites, chronological observations, and sensor-to-sensor comparisons. The spatial, temporal, and spectral aspects of image congruence are discussed in [3 [Anuta I]].

Nagy discusses digital registration of an input image with a reference image by performing a transformation T (p. 391), including translation, rotation, and scaling (p. 392). Known image transforms for registration of one image with another are further taught in Hobrough, figure 1. "The desired output from the registration process is a spatially coincident set of digital pictures." Anuta I, p. 169. The digital pictures can represent multispectral scanner data (Anuta I, p. 169) and/or multitemporal data (Anuta II, p. 354). Anuta I and Anuta II disclose correlation techniques to register the digital images. Anuta I and Anuta II describe that spatially registered images are used for analysis purposes as described in Fu (Fu is reference 3 in Anuta I and reference 1 in Anuta II).

Fu discloses analysis of registered multispectral image data for crop recognition. Each image corresponds to a spectral band,

where the spectral band is called a "feature"; see p. 642 for the correspondence between feature numbers and spectral bands.

Experiment 1 describes using features no. 2, no. 9, and no. 12 to perform a four-class classification analysis. The images may be visualized as shown in figure 1 (p. 354) of Anuta II, where the bottom image for channel A represents an image taken in one spectral band (say feature no. 2), the middle image for channel B represents an image taken in another spectral band (feature no. 9), and the top image for channel C represents an image taken in a third spectral band (feature no. 12). For each pixel coordinate (i,j) the values of the pixels in the three images forms a "feature vector." The values of the feature vector are classified by a computer into one of four classes: bare soil, water, green vegetation, and others (p. 645). This necessarily involves a comparison of the feature vector values and an output of the classification (figure 3, p. 641).

It is seen that registration is a form of pre-processing that it necessary to spatially align images for further processing or other operations (such as the photogrammetric operations described in Hobrough, col. 1, lines 18-38). The remote sensing example described in these four references corresponds to the remote sensing and surveillance application mentioned by Appellant at

page 494 of the specification. It would seem that the Examiner could find other examples in the applications mentioned by Appellant (specification, pp. 493-502), such as automatic pattern recognition, robotics (machine vision), artificial intelligence, inspection systems, etc.

In addition, I note that Nickel, applied only in the rejection of claim 13, discloses image registration by an image warp transformation followed by generation of a difference image showing differences, only, between a first and second image. The preparation of a difference image necessarily involves a comparison between the registered image and the input image.



LEE E. BARRETT
Administrative Patent Judge

) BOARD OF PATENT
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Appeal No. 1994-3042
Application No. 07/289,355

Page 43

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| NOTICE OF REFERENCES CITED | | | | APPLICANT(S) Gilbert P. Hyatt | | | |
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| EXAMINER Ian A. Calvert | | | DATE December 13, 2000 | | | | |
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| * A copy of this reference is not being furnished with this office action. (See Manual of Patent Examining Procedure, section 707.05(a).) | | | | | | | |

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EXAMINER

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DATE

December 13, 2000

Form 892ccs2106b

* A copy of this reference is not being furnished with this office action.
(See Manual of Patent Examining Procedure, section 707.05(a).)

**Ex parte Hyatt, Decision on Rehearing, Appeal No. 2004-0353,
in patent application Serial No. 08/457,211
(PTO Bd. App. Sept. 21, 2005) (unpublished PTO decision)**

UNITED STATES PATENT AND TRADEMARK OFFICE

**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Ex parte GILBERT P. HYATT

Appeal No. 2004-0353
Application No. 08/457,211

HEARD: April 6, 2005

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U.S. PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS
AND INTERFERENCES

Before HAIRSTON, GROSS, and BARRY, *Administrative Patent Judges*.
BARRY, *Administrative Patent Judge*.

I. DECISION ON REQUEST FOR REHEARING

A patent examiner rejected claims 125-136, 139, 148-153, 156-161, 164-177, 183-185, 194-202, 210-214, 220-222, 234-238, 250-257, 266-291, 298, 299, 306, 307, and 314-522. (Final Rej. at 3, 13-14, 16.) The appellant did not appeal the rejection of claims 148-150, 164-166, 183-185, 212-214, 324-328, 333, 337, 342, and 347. (Supp. Appeal Br. at 7.) He did, however, appeal the rejection of claims 125-136, 139, 151-153, 156-161, 167-177, 194-202, 210, 211, 220-222, 234-238, 250-257, 266-291, 298, 299, 306, 307, 314-323, 329-332, 334-336, 338-341, 343-346, and 348-522. We affirmed. *Ex parte Hyatt*, No. 2004-0353, slip op. at 1 (Bd.Pat.App. & Int. May 31,

2005). Pursuant to 37 C.F.R. § 41.52(a)(1), the appellant now asks us to reconsider our affirmance of some of the examiner's rejections. (Req. Reh'g at i.)

II. OPINION

We address the contested rejections in the following order:

- written description rejection of claims 125, 128, 131, 134, 139, 151, 156, 159, 167, 170, 172, 175, 194, 196, 199, 202, 210, 220, 234, 236, 250, 252, 255, 266, 268, 271, 274, 276, 279, 282, 284, 287, 290, 298, 306, 314, 316, 319, 322, 370, 375, 376, 381, 385, 390, 394, 399, 400, 405, 410, 415, 420, 424, 428, 429, 434, 439, 443, 444, 449, 454, 459, 463, 467, 472, 477, 482, 487, 491, 496, and 500-522
- enablement rejection of claims 127, 133, 136, 153, 158, 161, 198, 201, 257, 270, 278, 281, 286, 372, 378, 387, 392, 396, 407, 412, 422, 426, 431, 441, 446, 451, 456, 465, 479, 489, and 493
- obviousness rejection of claims 151-153 and 334
- obviousness rejection of claims 175-177 and 341.

A. WRITTEN DESCRIPTION REJECTION of Claims 125, 128, 131, 134, 139, 151, 156, 159, 167, 170, 172, 175, 194, 196, 199, 202, 210, 220, 234, 236, 250, 252, 255, 266, 268, 271, 274, 276, 279, 282, 284, 287, 290, 298, 306, 314, 316, 319, 322, 370, 375, 376, 381, 385, 390, 394, 399, 400, 405, 410, 415, 420, 424, 428, 429, 434, 439, 443, 444, 449, 454, 459, 463, 467, 472, 477, 482, 487, 491, 496, and 500-522

At the outset, we remind the appellant that an "[a]pplicant should . . . specifically point out the support for any amendments made to the disclosure." M.P.E.P. § 2163.06 (6th ed., Rev. 2, July 1996). Here, as emphasized by the examiner, "[t]he claims on [a]ppeal are all newly added claims with new limitations. There are no original claims

remaining in the application." (Examiner's Answer at 9.) Had the appellant shown support in his original disclosure for each of the new claims **when he filed his amendments**, he might have preempted a written description rejection thereof.

The appellant chose not to do so. To the contrary, the examiner explains that the "[a]ppellant's discussion of claim 172 in the 'Summary of the Invention' of the Brief is the first time in the prosecution history of this application that he has presented any specific remarks directed to where he believes he has support for any specific claim, even though the claims have repeatedly been rejected under 35 U.S.C. 112, first paragraph." (Examiner's Answer at 49.)

For our part, we previously found that claims 125, 128, 131, 134, 139, 151, 156, 159, 167, 170, 175, 194, 196, 199, 202, 210, 220, 234, 236, 250, 252, 255, 266, 268, 271, 274, 276, 279, 282, 284, 287, 290, 298, 306, 314, 316, 319, 322, 370, 375, 376, 381, 385, 390, 394, 399, 400, 405, 410, 415, 420, 424, 428, 429, 434, 439, 443, 444, 449, 454, 459, 463, 467, 472, 477, 482, 487, 491, 496, and 500-522 stood or fell with representative claim 172.¹ The appellant now argues that he has **"argue[d] separately**

¹Claim 172 is the only independent claim that the appellant attempted to read on his specification. (Appeal Br. at 7-8.)

each claim and the combination of elements and the acts of each claim (Supp. Appeal Br. at Section 8.8 [sic]²). . . ." (Req. Reh'g at 2.)

"[T]o assure separate review by the Board of individual claims within each group of claims subject to a common ground of rejection, an appellant's brief to the Board must contain a clear statement for each rejection: (a) asserting that the patentability of claims within the group of claims subject to this rejection do not stand or fall together, and (b) identifying which individual claim or claims within the group are separately patentable and the reasons why the examiner's rejection should not be sustained." *In re McDaniel*, 293 F.3d 1379, 1383, 63 USPQ2d 1462, 1465 (Fed. Cir. 2002) (citing 37 C.F.R. § 1.192(c)(7)(2001)). "Merely pointing out differences in what the claims cover is not an argument as to why the claims are separately patentable." 37 C.F.R. § 1.192(c)(7)(2000). Rather, "[f]or each rejection under 35 U.S.C. 112, first paragraph, the argument shall specify the errors in the rejection and how the first paragraph of 35 U.S.C. 112 is complied with, including, as appropriate, how the specification and drawings, if any, . . . [d]escribe the subject matter defined by each of the rejected claims. . . ." 37 C.F.R. § 1.192(c)(8)(i)(A)(2000). "If the brief fails to meet either requirement, the Board is free to select a single claim from each group of claims subject

²Although the appellant's Supplemental Appeal Brief comprises Sections 8.1-8.7, it omits a "Section 8.8. . . ." (Req. Reh'g at 2.)

to a common ground of rejection as representative of all claims in that group and to decide the appeal of that rejection based solely on the selected representative claim." *McDaniel*, 293 F.3d at 1383, 63 USPQ2d at 1465.

Here, although the appellant alleged that "[t]he claims do not stand or fall together," (Appeal Br. at 10), he failed to satisfy the second requirement. His summaries of what claims 125, 128, 131, 134, 139, 151, 156, 159, 167, 170, 172, 175, 194, 196, 199, 202, 210, 220, 234, 236, 250, 252, 255, 266, 268, 271, 274, 276, 279, 282, 284, 287, 290, 298, 306, 314, 316, 319, 322, 370, 375, 376, 381, 385, 390, 394, 399, 400, 405, 410, 415, 420, 424, 428, 429, 434, 439, 443, 444, 449, 454, 459, 463, 467, 472, 477, 482, 487, 491, 496, and 500-522 cover, (Supp. Appeal Br. at 14-210), did not constitute an argument why the claims are separately patentable. Merely alleging that the examiner's rejection does "not establish why the express disclosure of the limitations in th[ese] claim[s] does not satisfy § 112-1," (*id.* at 14), moreover, did not challenge the rejection of the individual claims "with any reasonable specificity. . . ." *In re Nielsen*, 816 F.2d 1567, 1572, 2 USPQ2d 1525, 1528 (Fed. Cir. 1987).

Because the appellant failed to satisfy the second requirement, we were free to select a single claim from the aforementioned group of claims, which were subject to a common written description rejection, as representative of all claims in that group and to

decide the appeal of that rejection based solely on that claim. We selected claim 172 from the group and decided the appeal of the written description rejection of those claims based solely on that claim. *Hyatt*, at 11-19.

The appellant refers to the comments of Judge Sullivan in a pending action under 35 § U.S.C. 145 that the appellant is pursuing regarding copending applications. (Req. Reh'g at 3.) Because these comments are from a hearing on a motion in a **pending** civil action involving **different** patent applications, however, we do not find them relevant to the appeal of this patent application. Therefore, we maintain that claims 125, 128, 131, 134, 139, 151, 156, 159, 167, 170, 175, 194, 196, 199, 202, 210, 220, 234, 236, 250, 252, 255, 266, 268, 271, 274, 276, 279, 282, 284, 287, 290, 298, 306, 314, 316, 319, 322, 370, 375, 376, 381, 385, 390, 394, 399, 400, 405, 410, 415, 420, 424, 428, 429, 434, 439, 443, 444, 449, 454, 459, 463, 467, 472, 477, 482, 487, 491, 496, and 500-522 stand or fall with representative claim 172.³

Having found that the appellant failed to reasonably convey to the artisan that, as of the filing date of his application, the appellant had possession of displaying a background image overlaid by a window showing 3D images and a window showing

³ As indicated *supra*, claim 172 is the only independent claim that the appellant read on his specification. (Appeal Br. at 7-8.)

graphics, the latter window overlapping with the former window and the former window further overlaid by a menu "in response to the background image information overlaid with the first window of three dimensional perspective image information overlaid with the menu information and in response to the background image information overlaid with the overlapping second window of graphics image information," *Hyatt*, at 18-19, we maintain our affirmance of the written description rejection of claim 172 and of claims 125, 128, 131, 134, 139, 151, 156, 159, 167, 170, 175, 194, 196, 199, 202, 210, 220, 234, 236, 250, 252, 255, 266, 268, 271, 274, 276, 279, 282, 284, 287, 290, 298, 306, 314, 316, 319, 322, 370, 375, 376, 381, 385, 390, 394, 399, 400, 405, 410, 415, 420, 424, 428, 429, 434, 439, 443, 444, 449, 454, 459, 463, 467, 472, 477, 482, 487, 491, 496, and 500-522, which fall therewith.

B. ENABLEMENT REJECTION OF CLAIMS 127, 133, 136, 153, 158, 161, 198, 201, 257, 270, 278, 281, 286, 372, 378, 387, 392, 396, 407, 412, 422, 426, 431, 441, 446, 451, 456, 465, 479, 489, AND 493

The appellant now argues, "the output of the disclosed system is the product of the filtering performed in the system and thus is a filtered product." (Reg. Reh'g at 13.) He further argues, "there should be no dispute that the 'static photographs' product, when subjected to the disclosed filtering acts, constitute a **filtered** 'static photographs' product -- e.g.; a filtered product." (*Id.*)

"A party cannot wait until after the Board has rendered an adverse decision and then present new arguments in a request for reconsideration." *Cooper v. Goldfarb*, 154 F.3d 1321, 1331, 47 USPQ2d 1896, 1904 (Fed. Cir. 1998) (citing *Moller v. Harding*, 214 USPQ 730, 731 (Bd. Pat. App. & Int. 1982), *aff'd*, 714 F.2d 160 (Fed. Cir. 1983) (table)). Furthermore, an argument advanced in a petition for reconsideration but not previously advanced in a brief or reply brief "is not properly before us." *Ex parte Hindersinn*, 177 USPQ 78, 80 (Bd. Pat. App. & Int. 1971).

Here, the appellant failed to argue "that the 'static photographs' product, when subjected to the disclosed filtering acts, constitute a filtered 'static photographs' product -- e.g.; a filtered product," (Reg. Reh'g at 13), in his appeal brief, his supplementary appeal brief, or his reply brief. Furthermore, we notified the appellant that our original affirmance was based only on the arguments made in these briefs and that arguments not made therein were neither before us nor at issue but were considered waived. *Hyatt*, at 57-58.

Because the appellant failed to argue "that the 'static photographs' product, when subjected to the disclosed filtering acts, constitute a filtered 'static photographs' product -- e.g.; a filtered product," (Reg. Reh'g at 13), in his briefs, the new argument is not properly before us. For the same reason, the examiner has had no chance to

respond to the argument. Therefore, we maintain our affirmance of the enablement rejection of claims 127, 133, 136, 153, 158, 161, 198, 201, 257, 270, 278, 281, 286, 372, 378, 387, 392, 396, 407, 412, 422, 426, 431, 441, 446, 451, 456, 465, 479, 489, and 493.

C. OBVIOUSNESS REJECTION OF CLAIMS 151-153 AND 334

Although the appellant summarized what claims 152, 153, and 334 cover, (Supp. Appeal Br. at 24, 25, 85), this did not constitute an argument why the claims are separately patentable. His mere allegation that the examiner's rejection does not establish the "obviousness of this combination of limitations, nor obviousness of the recited cooperation between the limitations in th[ese] claim[s]," (*id.*), moreover, did not challenge the rejection of the individual claims with any reasonable specificity. Therefore, we maintain that claims 152, 153, and 334 stand or fall with representative claim 151.

With this representation in mind, rather than reiterate the positions of the examiner or the appellant *in toto*, we focus on the point of contention therebetween. The examiner found, "for pull-down type menus, a cursor needs to be used to select the appropriate function. This is clearly taught by Lapson (US Patent Number 4,464,652), in reference to the menu information (e.g., column 6, lines 20-39)." (Examiner's Answer

at 89-90.) The appellant now argues, "there is no reasonable basis for combining the television transmission system of Netravali with the pilot training simulator of Marsh."
(Reg. Reh'g at 14.)

"In addressing the point of contention, the Board conducts a two-step analysis. First, we construe the representative claim at issue to determine its scope. Second, we determine whether the construed claim would have been obvious." *Ex Parte Massingill*, No. 2003-0506, 2004 WL 1646421, at *2 (Bd.Pat.App & Int. 2004).

a. Claim Construction

"Analysis begins with a key legal question — *what is the invention claimed?*" *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1567, 1 USPQ2d 1593, 1597 (Fed. Cir. 1987). In answering the question, "the Board must give claims their broadest reasonable construction. . . ." *In re Hyatt*, 211 F.3d 1367, 1372, 54 USPQ2d 1664, 1668 (Fed. Cir. 2000). "Moreover, limitations are not to be read into the claims from the specification." *In re Van Geuns*, 988 F.2d 1181, 1184, 26 USPQ2d 1057, 1059 (Fed. Cir. 1993) (citing *In re Zletz*, 893 F.2d 319, 321, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989)).

Here, claim 151 recites in pertinent part the following limitations: "generating cursor information. . . ." Giving the representative claim its broadest, reasonable construction, we construed the limitations to require displaying a cursor on a screen. *Hyatt*, at 50.

b. Obviousness Determination

"Non-obviousness cannot be established by attacking references individually where the rejection is based upon the teachings of a combination of references." *In re Merck*, 800 F.2d, 1091, 1097, 231 USPQ 375, 380 (Fed. Cir. 1986) (citing *In re Keller*, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981)). "Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art." *Cable Elec. Prods., Inc. v. Genmark, Inc.*, 770 F.2d 1015, 1025, 226 USPQ 881, 886-87 (Fed. Cir. 1985) (quoting *Keller*, 642 F.2d at 425, 208 USPQ at 881).

Here, the examiner relied on Lapson rather than Netravali for displaying a cursor on a screen. For its part, the former reference discloses "[a] cursor control device having particular application for use in conjunction with a computer display system. . . ." Col. 3, ll. 4-5. The cursor control device 20 "is coupled to a display system which is controlled by a computer or other equivalent circuitry. Appropriate programming of the computer is provided such that a 'menu' bar 100 comprising a variety of command

options indicated by titles (for example, $T_1, T_2, T_3 \dots T_n$), is displayed across the CRT screen. . . ." Col. 5, l. 68 - col. 6, l. 4. "If a particular title (for example T_1) is selected, one or more sub-command items 104 are displayed by the computer system below the primary menu title. As illustrated, the sub-command items appear to the user to be 'pulled down' from the main menu bar 100." Col. 6, ll. 4-9.

"A user desiring to select a particular title moves cursor control unit 20 over a surface, thereby . . . sending signals indicative of X-Y locations to the display system for corresponding movement of a cursor or the like on the display screen." *Id.* at ll. 20-25, Our finding that such a movement of a cursor displays the cursor on the screen, *Hyatt*, at 51, is uncontested. "The appellant's '[s]ilence implies assent.'" *Ex parte Knapton*, 67 USPQ2d 1059, 1060 (Bd.Pat.App. & Int. 2002) (quoting *Harper & Row Publishers, Inc. v. Nation Enters.*, 471 U.S. 539, 572, 225 USPQ 1073, 1085 (1985)). Therefore, we maintain our affirmance of the obviousness rejection of claim 151 and of claims 152, 153, and 334, which fall therewith.

D. OBVIOUSNESS REJECTION OF CLAIMS 175-177 AND 341

Although the appellant summarized what claims 176, 177, and 341 cover, (Supp. Appeal Br. at 35, 36, 88, and 89), this did not constitute an argument why the claims are separately patentable. His mere allegation that the examiner's rejection does not

establish the "obviousness of this combination of limitations, nor the obviousness of the recited cooperation between limitations in th[ese] claim[s]," (*id.*), moreover, did not challenge the rejection of the individual claims with any reasonable specificity.

Therefore, claims 176, 177, and 341 stand or fall with representative claim 175.

The examiner found, "[a]s shown in Figure 2A, Image Window 262 is at the base of the Pyramid of Vision." (Examiner's Answer at 85.) The appellant now argues, "there is no reasonable basis for combining the television transmission system of Netravali with the pilot training simulator of Marsh." (Reg. Reh'g at 14.)

a. Claim Construction

Claim 175 recites in pertinent part the following limitations: "generating a window of three dimensional perspective image information. . . ." Giving the representative claim its broadest, reasonable construction, we construed the limitations to require generating a window showing a three dimensional ("3D") image.

b. Obviousness Determination

The examiner relied on Marsh rather than Netravali for generating a window showing a 3D image. We found that Marsh generates a window, viz., "image window 262." Col. 16, l. 40. As shown in Figure 2A of the reference, moreover, the

image window 262 depicts a "3D HANGER 240" *inter alia*. Because Marsh's image window depicts a 3D image of a hanger, we found that the reference generates a window showing a 3D image, a finding that is uncontested. Therefore, we maintain our affirmance of the obviousness rejection of claim 175 and of claims 176, 177, and 341, which fall therewith.

III. CONCLUSION

In summary, we deny the appellant's request to reverse the rejection of claims 125, 128, 131, 134, 139, 151, 156, 159, 167, 170, 172, 175, 194, 196, 199, 202, 210, 220, 234, 236, 250, 252, 255, 266, 268, 271, 274, 276, 279, 282, 284, 287, 290, 298, 306, 314, 316, 319, 322, 370, 375, 376, 381, 385, 390, 394, 399, 400, 405, 410, 415, 420, 424, 428, 429, 434, 439, 443, 444, 449, 454, 459, 463, 467, 472, 477, 482, 487, 491, 496, and 500-522 under § 112, ¶ 1, as lacking a written description. We likewise deny his request to reverse the rejection of claims 127, 133, 136, 153, 158, 161, 198, 201, 257, 270, 278, 281, 286, 372, 378, 387, 392, 396, 407, 412, 422, 426, 431, 441, 446, 451, 456, 465, 479, 489, and 493 under § 112, ¶ 1, as non-enabled. In addition, we deny the appellant's request to reverse the rejection of claims 151-153, 175-177, 334, and 341 under § 103(a).

"Any arguments or authorities not included in the brief will be refused consideration by the Board of Patent Appeals and Interferences. . . ." 37 C.F.R. § 1.192(a). Accordingly, our affirmance is based only on the arguments made in the briefs. Any arguments or authorities omitted therefrom are neither before us nor at issue but are considered waived. *Cf. In re Watts*, 354 F.3d 1362, 1367, 69 USPQ2d 1453, 1457 (Fed. Cir. 2004) ("[I]t is important that the applicant challenging a decision not be permitted to raise arguments on appeal that were not presented to the Board.") No time for taking any action connected with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

DENIED

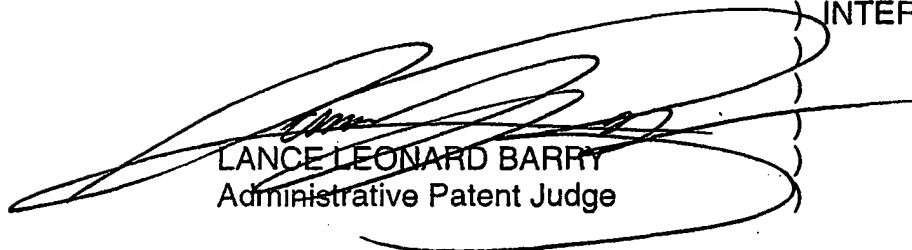


KENNETH W. HAIRSTON
Administrative Patent Judge



ANITA PELLMAN GROSS
Administrative Patent Judge

) BOARD OF PATENT
) APPEALS
) AND
) INTERFERENCES



LANCE LEONARD BARRY
Administrative Patent Judge

Appeal No. 2004-0353
Application No. 08/457,211

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**Ex parte Hyatt, Decision on Appeal No. 2004-0353,
in patent application Serial No. 08/457,211
(PTO Bd. App. May 31, 2005) (unpublished PTO decision)**

UNITED STATES PATENT AND TRADEMARK OFFICE

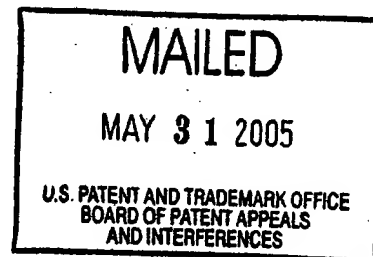
**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Ex parte GILBERT P. HYATT

Appeal No. 2004-0353
Application No. 08/457,211

HEARD: April 6, 2005

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Before HAIRSTON, GROSS, and BARRY, *Administrative Patent Judges*.
BARRY, *Administrative Patent Judge*.

DECISION ON APPEAL

A patent examiner rejected claims 125-136, 139, 148-153, 156-161, 164-177, 183-185, 194-202, 210-214, 220-222, 234-238, 250-257, 266-291, 298, 299, 306, 307, and 314-522. (Final Rej. at 3, 13-14, 16.) The appellant does not appeal the rejection of claims 148-150, 164-166, 183-185, 212-214, 324-328, 333, 337, 342, and 347. (Supp. Appeal Br. at 7.) He does, however, appeal the rejection of claims 125-136, 139, 151-153, 156-161, 167-177, 194-202, 210, 211, 220-222, 234-238, 250-257, 266-291, 298, 299, 306, 307, 314-323, 329-332, 334-336, 338-341, 343-346, and 348-522 under 35 U.S.C. § 134(a). We affirm.

BACKGROUND

The invention at issue on appeal concerns "an operator interactive window display. . . ." (Reply Br. at 147.) A further understanding of the invention can be achieved by reading the following claims.

125. A process comprising the acts of:

- storing first data decompressed image information in a memory;

- generating background image information in response to the first data decompressed image information;

- storing second three dimensional perspective data decompressed image information in the memory;

- generating irregularly cropped image information by cropping to an irregular outline in response to the second three dimensional perspective data decompressed image information;

- generating irregularly cropped textured image information by texturing in response to the irregularly cropped image information;

- generating irregularly cropped overlaid image information by overlaying in response to the irregularly cropped textured image information and in response to the background image information; and

- displaying a first window containing the first data decompressed image information and displaying a second window containing the irregularly cropped overlaid image information.

128. A process comprising the acts of:

- generating operator input information;

- generating background image information;

generating data compressed image information;

generating data decompressed image information in response to the data compressed image information;

generating a first window of data decompressed image information in response to the data decompressed image information;

overlaying the first window of data decompressed image information onto the background image information;

generating first menu information in response to the operator input information;

nondestructively overlaying the first menu information onto the first window of data decompressed image information;

generating a second window of data decompressed image information in response to the data decompressed image information;

overlaying the second window of data decompressed image information onto the background image information overlapping with the first window of data decompressed image information;

generating second menu information in response to the operator input information;

nondestructively overlaying the second menu information onto the second window of data decompressed image information; and

displaying a background image overlaid by a first window of data decompressed images further nondestructively overlaid by a first menu image and overlaid by an overlapping second window of data decompressed images further nondestructively overlaid by a second menu image in response to the background image information overlaid with the first window of data decompressed image information overlaid with the first menu information and in response to the background image information overlaid with the overlapping second window of data decompressed image information overlaid with the second menu information.

151. A process comprising the acts of:

generating a window of three dimensional perspective image information;

generating cursor information; and

overlaying the cursor information onto the window of three dimensional perspective image information.

159. A process comprising the acts of:

generating a window of three dimensional perspective image information;

generating icon image information; and

overlaying the icon image information onto the window of three dimensional perspective image information.

167. A process comprising the acts of:

generating a window of three dimensional perspective image information;

generating data compressed video image information;

generating first data decompressed video image information in response to the data compressed video image information;

generating background video image information in response to the first data decompressed video image information;

generating second data decompressed video image information in response to the data compressed video image information;

generating irregularly cropped video image information by cropping to an irregular outline in response to the second data decompressed video image information;

generating irregularly cropped textured video image information by texturing in response to the irregularly cropped video image information;

generating irregularly cropped overlaid video image information by overlaying in response to the irregularly cropped textured video image information and in response to the background video image information; and

overlaying the irregularly cropped overlaid video image information on the window of three dimensional perspective image information.

172. A process comprising the acts of:

generating operator input information;

generating background image information;

generating menu information in response to the operator input information;

generating a first window of three dimensional perspective image information;

overlaying the first window of three dimensional perspective image information onto the background image information;

overlaying the menu information onto the first window of three dimensional perspective image information;

generating a second window of graphics image information;

overlaying the second window of graphics image information onto the background image information overlapping with the first window of three dimensional perspective image information; and

displaying a background image overlaid by a first window of three dimensional perspective images further overlaid by a menu image and overlaid by an overlapping second window of graphics images in response to the background image information overlaid with the first window of three dimensional perspective image information overlaid with the menu information and in response to the background image information overlaid with the overlapping second window of graphics image information.

175. A process comprising the acts of:

- generating operator input information;

- generating control information in response to the operator input information;

- generating a window of three dimensional perspective image information;

- generating alphanumeric character information in response to the control information; and

- overlaying the alphanumeric character information onto the window of three dimensional perspective image information.

220. A process comprising the acts of:

- generating data compressed image information;

- generating first data decompressed image information in response to the data compressed image information;

- generating background image information in response to the first data decompressed image information;

- generating second data decompressed image information in response to the data compressed image information;

generating irregularly cropped image information by cropping to an irregular outline in response to the second data decompressed image information;

generating irregularly cropped textured image information by texturing in response to the irregularly cropped image information;

generating irregularly cropped overlaid image information by overlaying in response to the irregularly cropped textured image information and in response to the background image information;

generating a window of three dimensional perspective image information in response to the irregularly cropped overlaid image information; and

displaying a three dimensional perspective window in response to the window of three dimensional perspective image information.

Claims 125-136, 139, 151-153, 156-161, 167-177, 194-202, 210, 211, 220-222, 234-238, 250-257, 266-291, 298, 299, 306, 307, 314-323, 329-332, 334-336, 338-341, 343-346, and 348-522 stand rejected under 35 U.S.C. § 112, ¶ 1, as lacking a written description and under § 112, ¶ 1, as non-enabled. The same claims also stand rejected under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 4,179,824 ("Marsh") and U.S. Patent No. 4,245,248 ("Netravali"), with U.S. Patent No. 4,464,652 ("Lapson") "cited . . . as evidence to support the examiner's taking of Official Notice. . . ."

(Examiner's Answer at 88.)

OPINION

Our opinion addresses the rejections in the following order:

- written description rejection
- enablement rejection
- obviousness rejection.

A. WRITTEN DESCRIPTION REJECTION

At the outset, we remind the appellant that an "[a]pplicant should . . . specifically point out the support for any amendments made to the disclosure." M.P.E.P. § 2163.06 (6th ed., Rev. 2, July 1996). Here, as emphasized by the examiner, "[t]he claims on [a]ppeal are all newly added claims with new limitations. There are no original claims remaining in the application." (Examiner's Answer at 9.) Had the appellant shown support in his original disclosure for each of the new claims **when he filed his amendments**, he might have preempted a written description rejection thereof. The appellant chose not to do so. To the contrary, the examiner explains that the "[a]ppellant's discussion of claim 172 in the 'Summary of the Invention' of the Brief is the first time in the prosecution history of this application that he has presented any specific remarks directed to where he believes he has support for any specific claim, even though the claims have repeatedly been rejected under 35 U.S.C. 112, first

paragraph." (Examiner's Answer at 49.) Faced with the resultant written description rejection, we address the claims in the following order:

- claims 125, 128, 131, 134, 139, 151, 156, 159, 167, 170, 472, 175, 194, 196, 199, 202, 210, 220, 234, 236, 250, 252, 255, 266, 268, 271, 274, 276, 279, 282, 284, 287, 290, 298, 306, 314, 316, 319, 322, 370, 375, 376, 381, 385, 390, 394, 399, 400, 405, 410, 415, 420, 424, 428, 429, 434, 439, 443, 444, 449, 454, 459, 463, 467, 472, 477, 482, 487, 491, 496, and 500-522
- claims 126, 129, 130, 132, 135, 152, 157, 160, 168, 169, 171, 173, 174, 176, 177, 195, 197, 200, 211, 221, 222, 235, 237, 238, 251, 253, 254, 256, 267, 269, 272, 273, 275, 277, 280, 283, 285, 288, 289, 291, 299, 307, 315, 317, 318, 320, 321, 323, 329-332, 334-336, 338-341, 343-346, 348-369, 371, 373, 374, 377, 379, 380, 382, 383, 384, 386, 388, 389, 391, 393, 395, 397, 398, 401-404, 406, 408, 409, 411, 413, 414, 416-419, 421, 423, 425, 427, 430, 432, 433, 435-438, 440, 442, 445, 447, 448, 450, 452, 453, 455, 457, 458, 460-462, 466, 464, 468-471, 473-476, 478, 480, 481, 483-486, 488, 490, 492, 494, 495, and 497-499
- claims 127, 133, 136, 153, 158, 161, 198, 201, 257, 270, 278, 281, 286, 372, 378, 387, 392, 396, 407, 412, 422, 426, 431, 441, 446, 451, 456, 465, 479, 489, and 493.

1. Claims 125, 128, 131, 134, 139, 151, 156, 159, 167, 170, 172, 175, 194, 196, 199, 202, 210, 220, 234, 236, 250, 252, 255, 266, 268, 271, 274, 276, 279, 282, 284, 287, 290, 298, 306, 314, 316, 319, 322, 370, 375, 376, 381, 385, 390, 394, 399, 405, 410, 415, 420, 424, 428, 429, 434, 439, 443, 444, 449, 454, 459, 463, 467, 472, 477, 482, 487, 491, 496, and 500-522

"[T]o assure separate review by the Board of individual claims within each group of claims subject to a common ground of rejection, an appellant's brief to the Board must contain a clear statement for each rejection: (a) asserting that the patentability of claims within the group of claims subject to this rejection do not stand or fall together,

and (b) identifying which individual claim or claims within the group are separately patentable and the reasons why the examiner's rejection should not be sustained." *In re McDaniel*, 293 F.3d 1379, 1383, 63 USPQ2d 1462, 1465 (Fed. Cir. 2002) (citing 37 C.F.R. §1.192(c)(7) (2001)). "Merely pointing out differences in what the claims cover is not an argument as to why the claims are separately patentable." 37 C.F.R. § 1.192(c)(7) (2000). Rather, "[f]or each rejection under 35 U.S.C. 112, first paragraph, the argument shall specify the errors in the rejection and how the first paragraph of 35 U.S.C. 112 is complied with, including, as appropriate, how the specification and drawings, if any, . . . [d]escribe the subject matter defined by each of the rejected claims. . . ." 37 C.F.R. § 1.192(c)(8)(i)(A)(2000). "If the brief fails to meet either requirement, the Board is free to select a single claim from each group of claims subject to a common ground of rejection as representative of all claims in that group and to decide the appeal of that rejection based solely on the selected representative claim." *McDaniel*, 293 F.3d at 1383, 63 USPQ2d at 1465.

Here, although the appellant alleges that "[t]he claims do not stand or fall together," (Appeal Br. at 10), he fails to satisfy the second requirement. His summaries of what claims 125, 128, 131, 134, 139, 151, 156, 159, 167, 170, 172, 175, 194, 196, 199, 202, 210, 220, 234, 236, 250, 252, 255, 266, 268, 271, 274, 276, 279, 282, 284, 287, 290, 298, 306, 314, 316, 319, 322, 370, 375, 376, 381, 385, 390, 394, 399, 400,

405, 410, 415, 420, 424, 428, 429, 434, 439, 443, 444, 449, 454, 459, 463, 467, 472, 477, 482, 487, 491, 496, and 500-522 cover, (Supp. Appeal Br. at 14-210), do not constitute an argument why the claims are separately patentable. Merely alleging that the examiner's rejection does "not establish why the express disclosure of the limitations in th[ese] claim[s] does not satisfy § 112-1," (*id.* at 14), moreover, does not challenge the rejection of the individual claims "with any reasonable specificity. . . ." *In re Nielsen*, 816 F.2d 1567, 1572, 2 USPQ2d 1525, 1528 (Fed. Cir. 1987). Therefore, claims 125, 128, 131, 134, 139, 151, 156, 159, 167, 170, 175, 194, 196, 199, 202, 210, 220, 234, 236, 250, 252, 255, 266, 268, 271, 274, 276, 279, 282, 284, 287, 290, 298, 306, 314, 316, 319, 322, 370, 375, 376, 381, 385, 390, 394, 399, 400, 405, 410, 415, 420, 424, 428, 429, 434, 439, 443, 444, 449, 454, 459, 463, 467, 472, 477, 482, 487, 491, 496, and 500-522 stand or fall with representative claim 172.¹ With this representation in mind, rather than reiterate the positions of the examiner or the appellant *in toto*, we focus on the two points of contention therebetween, which follow:

- overlaying a first window of three dimensional perspective image information onto background image information; overlaying menu information onto the first window of three dimensional perspective image information; and overlaying a second window of graphics image information onto the background image information overlapping with the first window of three dimensional perspective image information

¹Claim 172 is the only independent claim that the appellant attempts to read on his specification. (Appeal Br. at 7-8.)

- displaying a background image overlaid by a first window of three dimensional perspective images further overlaid by a menu image and overlaid by an overlapping second window of graphics images in response to the background image information overlaid with the first window of three dimensional perspective image information overlaid with the menu information and in response to the background image information overlaid with the overlapping second window of graphics image information.

a. Overlaying a first window of three dimensional perspective image information onto background image information; overlaying menu information onto the first window of three dimensional perspective image information; and overlaying a second window of graphics image information onto the background image information overlapping with the first window of three dimensional perspective image information

The examiner finds, "[w]hile there is a section of the specification titled 'Overlays' on pages 386-411, this section does not describe the claimed process of 'overlaying' a 'window of three dimensional perspective image information onto the background image information'." (Examiner's Answer at 30). Observing that "the term 'menu' does not appear in the section directed to 'overlays,' (*id.* at 32), he further finds, "[t]herefore, the specification cannot be considered to describe the claimed 'overlaying the menu information onto the second window of three dimensional perspective image information'." (*id.* at 32-33.) Noting that "the term 'graphics' does appear numerous times in the section titled 'Overlays,'" (*id.* at 33), the examiner finds, "none of this discussion is directed to the claimed limitation of 'overlaying the first window of graphics image information onto the background image information'. . . ." (*id.*) The appellant

cites "Spec. at page 24 item I.E.2., page 548 lines 120 and 171, page 549 line 632, page 551 line 2020). . . ." (Appeal Br. at 8.)

In addressing the point of contention, the Board conducts a two-step analysis. First, we construe claim at issue to determine their scope. Second, we determine whether the construed claim has adequate support.

i. Claim Construction

"Analysis begins with a key legal question — *what is the invention claimed?*"

Panduit Corp. v. Dennison Mfg. Co., 810 F.2d 1561, 1567, 1 USPQ2d 1593, 1597 (Fed. Cir. 1987). Here, representative claim 172 recites in pertinent part the following limitations:

overlaying the first window of three dimensional perspective image information onto the background image information;

overlaying the menu information onto the first window of three dimensional perspective image information;

generating a second window of graphics image information;

overlaying the second window of graphics image information onto the background image information overlapping with the first window of three dimensional perspective image information. . . .

Accordingly, the limitations require overlaying a window showing at least one three dimensional ("3D") image onto a background image; overlaying a menu onto the

window showing the 3D image; and overlaying a window showing graphics onto the background image such that it overlaps with the window showing the 3D image.

ii. Support Determination

"[C]ompliance with the written description requirement is a question of fact." *Hyatt v. Boone*, 146 F.3d 1348, 1352, 47 USPQ 2d 1128, 1130 (Fed. Cir. 1998) (citing *Vas-Cath, Inc. v. Mahurkar*, 935 F.2d 1555, 1563, 19 USPQ2d 1111, 1116 (Fed. Cir. 1991)). "Although [the applicant] does not have to describe exactly the subject matter claimed, . . . the description must clearly allow persons of ordinary skill in the art to recognize that [he or she] invented what is claimed." *Vas-Cath*, 935 F.2d at 1563, 19 USPQ2d at 1116 (quoting *In re Gosteli*, 872 F.2d 1008, 1012, 10 USPQ2d 1614, 1618 (Fed. Cir. 1989)). "[T]he test for sufficiency of support . . . is whether the disclosure of the application relied upon 'reasonably conveys to the artisan that the inventor had possession at that time of the later claimed subject matter.'" *Ralston Purina Co. v. Far-Mar-Co., Inc.*, 772 F.2d 1570, 1575, 227 USPQ 177, 179 (Fed. Cir. 1985) (quoting *In re Kaslow*, 707 F.2d 1366, 1375, 217 USPQ 1089, 1096 (Fed. Cir. 1983)). "Application sufficiency under §112, first paragraph, must be judged as of the filing date [of the application]." *Vas-Cath*, 935 F.2d at 1566, 19 USPQ2d at 1119 (citing *United States Steel Corp. v. Phillips Petroleum Co.*, 865 F.2d 1247, 1251, 9 USPQ2d 1461, 1464 (Fed. Cir. 1989)).

Turning to passages of the specification cited by the appellant, item I.E.2 is merely an entry in a table that reads "Digital word, supervisory processor or keyboard." (Spec. at 24.) With no mention therein of windows, a 3D image, a background image, a menu, graphics, overlaying, or overlapping, we find that the entry fails to reasonably convey to the artisan that, as of the filing date of his application, the appellant had possession of overlaying a window showing at least one 3D image onto a background image; overlaying a menu onto the window showing the 3D image; and overlaying a window showing graphics onto the background image such that it overlaps with the window showing the 3D image.

The other passages cited by the appellant are lines from a computer program entitled "LD.ASC." (*Id.* at 547.) More specifically, lines 120 and 171 are nothing more than commands to print the directions, "SELECT OVERLAY FOR LOADING INTO IMAGE MEMORY . . . 1," (*Id.* at 548), and "SELECT OVERLAY FOR LOADING INTO IMAGE MEMORY," respectively. (*Id.*) Line 632 delineates a subroutine "TO OVERLAY A RECTANGLE." (*Id.* at 549.) Line 2020 returns the program to "RETURN TO [AN] OVERLAY MENU." (*Id.* at 551.) Although each of these lines mentions an "overlay," and the latter line also mentions a "menu," none mentions windows, a 3D image, a background image, graphics, or overlapping. Therefore, we find that the lines fail to reasonably convey to the artisan that, as of the filing date of his application, the

appellant had possession of overlaying a window of at least one 3D image onto a background image; overlaying a menu onto the window of the 3D image; and overlaying a window of graphics onto the background image such that it overlaps with the window of the 3D image.

b. Displaying a background image overlaid by a first window of three dimensional perspective images further overlaid by a menu image and overlaid by an overlapping second window of graphics images in response to the background image information overlaid with the first window of three dimensional perspective image information overlaid with the menu information and in response to the background image information overlaid with the overlapping second window of graphics image information

Observing that the "[a]ppellant discloses circuit diagrams showing connections between various circuit elements, such as Figure 6AC, and several flow diagrams such as Figure 2H," (Examiner's Answer at 14), the examiner makes the following finding.

Appellant's generalized block diagrams and circuit depictions . . . have no disclosed relationship with the claimed subject matter, and . . . do not depict the claimed elements interconnected and interrelated in such as [sic] manner as to produce the claimed results (e.g., 'displaying a background image overlaid by a first window of three dimensional perspective images further overlaid by a menu image and overlaid by an overlapping second window of graphics images in response to the background image information overlaid with the first window of three dimensional perspective image information overlaid with the menu information and in response to the background image information overlaid with the overlapping second window of graphics image information.'; claim 172). . . .

(*Id.*) The appellant cites "Spec. at pages 544-546. . . ." (Appeal Br. at 8.)

i. Claim Construction

Representative claim 172 recites in pertinent part the following limitations:

displaying a background image overlaid by a first window of three dimensional perspective images further overlaid by a menu image and overlaid by an overlapping second window of graphics images in response to the background image information overlaid with the first window of three dimensional perspective image information overlaid with the menu information and in response to the background image information overlaid with the overlapping second window of graphics image information.

Accordingly, the limitations require displaying a background image overlaid by a window showing 3D images and a window showing graphics, the latter window overlapping with the former window and the former window further overlaid by a menu "in response to the background image information overlaid with the first window of three dimensional perspective image information overlaid with the menu information and in response to the background image information overlaid with the overlapping second window of graphics image information."

ii. Support Determination

The first page of the specification cited by the appellant contains nothing more than the title "BASIC PROGRAM LISTING GRAPH.ASC." With no mention therein of a background image, windows, a 3D image, graphics, a menu, overlaying, or overlapping, we find that the title fails to reasonably convey to the artisan that, as of the filing date of his application, the appellant had possession of displaying a background

image overlaid by a window showing 3D images and a window showing graphics, the latter window overlapping with the former window and the former window further overlaid by a menu "in response to the background image information overlaid with the first window of three dimensional perspective image information overlaid with the menu information and in response to the background image information overlaid with the overlapping second window of graphics image information."

The other pages cited by the appellant list the GRAPH.ASC computer program. (*Id.* at 545-46.) Although line 1990 of the program is labeled as "INITIALIZ[ING] GRAPHICS GENERATOR," (*id.* at 545), none of the lines of GRAPH.ASC mentions a background image, windows, a 3D image, a menu, overlaying, or overlapping. Therefore, we find that the listing fails to reasonably convey to the artisan that, as of the filing date of his application, the appellant had possession of displaying a background image overlaid by a window showing 3D images and a window showing graphics, the latter window overlapping with the former window and the former window further overlaid by a menu "in response to the background image information overlaid with the first window of three dimensional perspective image information overlaid with the menu information and in response to the background image information overlaid with the overlapping second window of graphics image information." Therefore, we affirm the written description rejection of claim 172 and of claims 125, 128, 131, 134, 139, 151,

156, 159, 167, 170, 175, 194, 196, 199, 202, 210, 220, 234, 236, 250, 252, 255, 266, 268, 271, 274, 276, 279, 282, 284, 287, 290, 298, 306, 314, 316, 319, 322, 370, 375, 376, 381, 385, 390, 394, 399, 400, 405, 410, 415, 420, 424, 428, 429, 434, 439, 443, 444, 449, 454, 459, 463, 467, 472, 477, 482, 487, 491, 496, and 500-522, which fall therewith.

2. Claims 126, 129, 130, 132, 135, 152, 157, 160, 168, 169, 171, 173, 174, 176, 177, 195, 197, 200, 211, 221, 222, 235, 237, 238, 251, 253, 254, 256, 267, 269, 272, 273, 275, 277, 280, 283, 285, 288, 289, 291, 299, 307, 315, 317, 318, 320, 321, 323, 329-332, 334-336, 338-341, 343-346, 348-369, 371, 373, 374, 377, 379, 380, 382, 383, 384, 386, 388, 389, 391, 393, 395, 397, 398, 401-404, 406, 408, 409, 411, 413, 414, 416-419, 421, 423, 425, 427, 430, 432, 433, 435-438, 440, 442, 445, 447, 448, 450, 452, 453, 455, 457, 458, 460-462, 464, 466, 468-471, 473-476, 478, 480, 481, 483-486, 488, 490, 492, 494, 495, and 497-499

Observing that "197 of the pending claims² recite limitations for making 'products' of one type or another," (Examiner's Answer at 40), the examiner asserts, "there is nothing in the originally filed specification to give direction as to how the various claimed 'products' should be interpreted." (*Id.* at 42.) The appellant alleges, "[t]he disclosure has verbatim and near-verbatim written description of 'product' claim limitations in combination with other claim limitations." (Reply Br. at 78.)

²The examiner should have enumerated all of the 197 claims.

Turning to the claims, claims 126, 129, 132, 135, 152, 157, 160, 168, 171, 173, 176, 195, 197, 200, 211, 221, 235, 237, 251, 253, 256, 267, 269, 272, 275, 277, 280, 283, 285, 288, 291, 299, 307, 315, 317, 320, 323, 371, 377, 382, 386, 391, 395, 401, 406, 411, 416, 421, 425, 430, 435, 440, 445, 450, 455, 460, 464, 468, 473, 478, 483, 488, 492, and 497 recite in pertinent part the making of a general "product."

Claims 329-332, 334-336, 338-341, 343-346, 348-369, 374, 380, 384, 389, 393, 398, 404, 409, 414, 419, 423, 427, 433, 438, 442, 448, 453, 458, 462, 466, 471, 476, 481, 486, 490, 495, and 499 recite in pertinent part the making of a general "first product."

Claims 169, 273, 329-332, 334-336, 338-341, 343-346, 348-369, 374, 380, 384, 388, 389, 393, 397, 398, 403, 404, 408, 409, 413, 414, 418, 419, 423, 427, 432, 433, 437, 438, 442, 447, 448, 452, 453, 457, 458, 462, 466, 470, 471, 475, 476, 480, 481, 485, 486, 490, 494, 495, and 499 recite in pertinent part the making of a general "second product." Claims 329-332, 334-336, 338-341, 343-346, 348-369, 374, 380, 384, 389, 393, 398, 404, 409, 414, 419, 423, 427, 433, 438, 442, 448, 453, 458, 462, 466, 471, 476, 481, 486, 490, 495, and 499 recite in pertinent part the making of a general "third product." Claims 130, 273, 373, 388, 408, 432, 457, 480, and 494 recite in pertinent part "making a display product." Claims 174 and 436 recite in pertinent part "making a graphic product." Claims 177 and 417 recite in pertinent part "making an information product." Claims 222, 321, and 474 recite in pertinent part "making a manufactured product." Claims 254 and 498 recite in pertinent part "making a communicated

product." Claims 289, 318, 383, 461, and 469 recite in pertinent part "making a data decompressed product." Claims 238, 338, 402, and 484 recite in pertinent part "making a communication product." Claims 379, 403, 413, 437, 447, 470, and 485 recite in pertinent part "making a design product."

The examiner finds, "with one exception, variations of the term 'product' (e.g., 'products') [are] used in the specification only in a mathematical sense (such as for multiplication or a sum-of-products)." (Examiner's Answer at 43.) The passage of the specification containing the "exception" discloses that "the final **product** of a graphic art system may be static photographs. . . ."³ (Spec. at 454⁴ (emphasis added).)

For our part, we find that the claimed making of a general "product," the claimed making of a general "first product," the claimed making of a general "second product," the claimed making of a general "third product," the claimed "making a display product," the claimed "making a graphic product," the claimed "making an information product," the claimed "making a manufactured product," the claimed "making a communicated product," the claimed "making a data decompressed product," the

³We are puzzled by the appellant's failure to cite the passage.

⁴The appellant should number the lines of his specifications to facilitate citation thereto.

claimed "making a communication product," and the claimed "making a design product" each refers to the disclosed making of static photographs.

The disclosed making of static photographs, however, does not cure the lack of support for the independent claims from which the aforementioned claims depend. Therefore, we also affirm the written description rejection of dependent claims 126, 129, 130, 132, 135, 152, 157, 160, 168, 169, 171, 173, 174, 176, 177, 195, 197, 200, 211, 221, 222, 235, 237, 238, 251, 253, 254, 256, 267, 269, 272, 273, 275, 277, 280, 283, 285, 288, 289, 291, 299, 307, 315, 317, 318, 320, 321, 323, 329-332, 334-336, 338-341, 343-346, 348-369, 371, 373, 374, 377, 379, 380, 382, 383, 384, 386, 388, 389, 391, 393, 395, 397, 398, 401-404, 406, 408, 409, 411, 413, 414, 416-419, 421, 423, 425, 427, 430, 432, 433, 435-438, 440, 442, 445, 447, 448, 450, 452, 453, 455, 457, 458, 460-462, 464, 466, 468-471, 473-476, 478, 480, 481, 483-486, 488, 490, 492, 494, 495, and 497-499.

3. *Claims 127, 133, 136, 153, 158, 161, 198, 201, 257, 270, 278, 281, 286, 372, 378, 387, 392, 396, 407, 412, 422, 426, 431, 441, 446, 451, 456, 465, 479, 489, and 493*

Observing that "pending claims," (Examiner's Answer at 40), "recite limitations for making one or more diverse types of products 'in response to' method or apparatus limitations of a parent claim," (*id.* at 42), the examiner finds, "[t]here is simply no description in the specification, or any depiction in the drawings, of making these

claimed 'products'." (*Id.*) The appellant alleges, "The disclosure has verbatim and near-verbatim written description of 'product' claim limitations in combination with other claim limitations." (Reply Br. at 78.)

Exemplifying the appellant's "making a product" limitations, dependent claim 158 recites "[a] process as set forth in claim 156, further comprising the act of making a filter product in response to the process set forth in claim 156." For its part, independent claim 156 recites the following limitations:

156. A process comprising the acts of:

generating background image information;

generating a first window of three dimensional perspective image information;

overlaying the first window of three dimensional perspective image information onto the background image information;

generating a second window of graphics image information;

overlaying the second window of graphics image information onto the background image information overlapping with the first window of three dimensional perspective image information; and

displaying a background image overlaid by a first window of three dimensional perspective images and overlaid by an overlapping second window of graphics images in response to the background image information overlaid with the first window of three dimensional perspective image information and in response to the background image information overlaid with the overlapping second window of graphics image information.

In the dependent claim, the limitations "further comprising" and "in response to" evidence that the act of "making a filter product" is an additional act in the process of the independent claim. The product does not result from the process of the parent claim; it results from some additional act of "making."

Turning to the specification, the appellant asserts, "[t]he disclosure has more than 200 occurrences of 'filter' terminology." (Reply Br. at 80.) He fails to explain, however, the meaning of the claimed "filter product" or how it relates to the "filter terminology" of the specification. Although the specification discusses "[a] spatial filter arrangement," (Spec. at 162), for example, the arrangement is not described as made in response to the process set forth in claim 156.

Because the appellant has not shown that the specification describes either the claimed "filter product" or the claimed act of "making" the filter product in response to the process set forth in claim 156, we find that the disclosure fails to reasonably convey to the artisan that, as of the filing date of his application, the appellant had possession of the claimed act of making a filter product in response to the process set forth in claim 156. Therefore, we affirm the written description rejection of claims 127, 133, 136, 153, 158, 161, 198, 201, 257, 270, 278, 281, 286, 372, 378, 387, 392, 396, 407, 412, 422, 426, 431, 441, 446, 451, 456, 465, 479, 489, and 493.

B. ENABLEMENT REJECTION

We address the enablement rejection of the claims in the following order:

- claims 125, 128, 151, 156, 159, 167, 170, 172, 175, 220, 234, 268, 271, 279, 284, 319, 370, 424, 434, 500, and 503-515
- claims 131, 134, 139, 194, 196, 199, 202, 210, 236, 250, 252, 255, 266, 274, 276, 282, 287, 290, 298, 306, 314, 316, 322, 375, 376, 381, 385, 390, 394, 399, 400, 405, 410, 415, 420, 428, 429, 439, 443, 444, 449, 454, 459, 463, 467, 472, 477, 482, 487, 491, 496, 501, and 516-522
- claims 126, 129, 130, 132, 135, 152, 157, 160, 168, 169, 171, 173, 174, 176, 177, 195, 197, 200, 211, 221, 222, 235, 237, 238, 251, 253, 254, 256, 267, 269, 272, 273, 275, 277, 280, 283, 285, 288, 289, 291, 299, 307, 315, 317, 318, 320, 321, 323, 329-332, 334-336, 338-341, 343-346, 348-369, 371, 373, 374, 377, 379, 380, 382, 383, 384, 386, 388, 389, 391, 393, 395, 397, 398, 401-404, 406, 408, 409, 411, 413, 414, 416-419, 421, 423, 425, 427, 430, 432, 433, 435-438, 440, 442, 445, 447, 448, 450, 452, 453, 455, 457, 458, 460-462, 464, 466, 468-471, 473-476, 478, 480, 481, 483-486, 488, 490, 492, 494, 495, and 497-499
- claims 127, 133, 136, 153, 158, 161, 198, 201, 257, 270, 278, 281, 286, 372, 378, 387, 392, 396, 407, 412, 422, 426, 431, 441, 446, 451, 456, 465, 479, 489, and 493.

1. *Claims 125, 128, 151, 156, 159, 167, 170, 172, 175, 220, 234, 268, 271, 279, 284, 319, 370, 424, 434, 500, and 503-515*

"[T]he PTO bears an initial burden of setting forth a reasonable explanation . . . why it believes that the scope of protection provided by that claim is not adequately enabled by the description of the invention provided in the specification of the application. . . ." *In re Wright*, 999 F.2d 1557, 1561-62, 27 USPQ2d 1510, 1513 (Fed. Cir. 1993) (citing *In re Marzocchi*, 439 F.2d 220, 223-24, 169 USPQ 367, 369-70

(CCPA 1971)). More specifically, "[t]o be enabling under §112, a patent must contain a description that enables one skilled in the art to make and use the claimed invention." *Atlas Powder Co. v. E. I. Du Pont de Nemours & Co.*, 750 F.2d 1569, 1576, 224 USPQ 409, 413 (Fed. Cir. 1984) (citing *Raytheon Co. v. Roper Corp.*, 724 F.2d 951, 960, 220 USPQ 592, 599 (Fed. Cir. 1983)).

"That some experimentation is necessary does not preclude enablement; the amount of experimentation, however, must not be unduly extensive." *Id.*, 224 USPQ at 413. "Factors to be considered in determining whether a disclosure would require undue experimentation," *In re Wands*, 858 F.2d 731, 737, 8 USPQ2d 1400, 1404 (Fed. Cir. 1988), include the breadth of the claims, the nature of the invention, the state of the prior art, the amount of direction or guidance presented, the presence or absence of working examples, the relative skill of those in the art, the predictability or unpredictability of the art, and the quantity of experimentation necessary. *Id.*, 8 USPQ2d at 1404.

Here, regarding the relative skill of those in the art, the examiner admits that "[i]mage processing is a highly skilled art." (Examiner's Answer at 58.) Concerning the predictability or unpredictability of the art, electrical elements have been described as "'predictable' factor[s]." *In re Vaeck*, 947 F.2d 488, 496, 20 USPQ2d 1438, 1445 (Fed.

Cir. 1991) (quoting *In re Fisher*, 427 F.2d 833, 839, 166 USPQ 18, 24 (CCPA 1970)).

With these factors in mind, we address the following points of contention between the examiner and the appellant:

- irregular cropping
- compressing and decompressing
- overlaying
- pull-down menu
- icon
- programming.

a. Irregular Cropping

Regarding claims 125, 167, 220, 234, and 284, the examiner makes the following assertion.

While several instances of "crop" and its derivative are present throughout the specification, none of these describe the structure of "generating irregularly cropped image information," nor do they describe "generating irregularly cropped image information in response to 3D perspective data decompressed image information." The specification is also lacking in how this process would be performed and what elements would be used to perform it.

(Examiner's Answer at 70.) Quoting from pages 28 and 388 of his specification, (Reply Br. at 72), the appellant argues, "[t]he disclosure has verbatim written description of 'irregular' cropping claim limitations in combination with other claim limitations." (*Id* at 71.)

Here, the claims at issue are broad. For example, claim 125 merely recites in pertinent part the following limitations: "generating irregularly cropped image information by cropping to an irregular outline," i.e., a broad step of cropping at least one image to an irregular outline. Concerning the nature of the invention, we agree with the appellant that these limitations are "no[t] complex claim limitations that would challenge a programmer or a display engineer." (Reply Br. at 90.) Regarding the amount of direction or guidance presented, the second page of the specification cited by the appellant defines irregular cropping as follows: "[t]extured overlays can be cropped to irregular external and internal features; i.e., a tree has an external outline defined by the external leaf and branch outline and has internal spaces between leaves and branches." (Spec. at 388.) Furthermore, the first page of the specification he cites explains that irregular cropping is done by a "[c]ombiner." (*Id.* at 28.)

In view of the aforementioned factors, we are unpersuaded that the specification would not have enabled one skilled in the art to use a combiner to crop a tree to the external outline of its leaves and branches and to the internal spaces between the leaves and branches. Therefore, we reverse the enablement rejection of claims 125 and 284. Regarding claims 167, 220, and 234, however, we have a further point of contention to consider, *infra*.

b. Compressing and Decompressing

Regarding claims 128, 167, 220, 234, 268, 271, 424, and 502, (Examiner's Answer at 73), the examiner asserts, "[t]hese processes (compression and decompression) are extremely complex and require specifics for one of ordinary skill in the art to understand what process is being performed and to make and use the system without undue burden of experimentation or delay." (*Id.* at 75.) The appellant directs us to "the whole section devoted to data compression (and decompression) entitled 'Database Data Compression' (Spec. at 435-438)." (Reply Br. at 25.)

The claims at issue are broad. For example, claim 128 merely recites in pertinent part the following limitations: "generating data compressed image information; generating data decompressed image information in response to the data compressed image information," i.e., broad steps of compressing and decompressing at least one image. Concerning the nature of the invention, we agree with the appellant that these limitations are "no[t] complex claim limitations that would challenge a programmer or a display engineer." (Reply Br. at 90.) Relevant to the state of the prior art, the examiner admits that "'data decompression' (the reverse of data compression) has, in general, been known for some time. . . ." (Examiner's Answer at 74.) Regarding the amount of direction or guidance presented, as noted by the appellant, *supra*, his specification includes a section describing database data compression. (Spec. at 435-

438.) For its part, Marsh discloses that its "terrain data base is compressed," col. 36, l. 60, without more specifics that those offered by the appellant.

In view of the aforementioned factors, we are unpersuaded that the specification would not have enabled one skilled in the art to compress data for and decompress data from a database. Therefore, we reverse the enablement rejection of claims 167, 220, 234, 268, 271, 424, and 502. Regarding claim 128, however, we have a further point of contention to consider, *infra*.

c. Overlaying

Regarding claims 128, 151, 156, 170, 172, 175, 434, 500, and 503-515, (Examiner's Answer at 66), the examiner makes the following assertion.

On page 395, the specification notes again that "The combining circuit can be a series of tristate multiplexers for overlaying", and that "For example, a flag in each pixel word associated with each overlaying image can be 0-set if the overlaying image occupies that pixel and can be 1-set if the overlaying image does not occupy that pixel". But then the disclosure stops short of explaining how these elements work to provide for overlaying, and concludes by reciting "Therefore, a plurality of overlaying images can be provided that are stored in a plurality of overlaying image memories" in the next sentence. This is as much of a disclosure on overlaying as can be found anywhere else in the specification. This is not a sufficient disclosure of how the claimed multiplexers, flag bits, and memories are used together to produce an enabling system for overlaying images without undue burden and experimentation.

(*Id.* at 68-69.) The appellant argues, "[a] whole section is directed to overlays of the types recited in the claims." (Reply Br. at 18.)

Concerning the nature of the invention, we agree with the appellant that "there are no complex claim limitations that would challenge a programmer or a display engineer." (*Id.* at 90.) Regarding the amount of direction or guidance presented, as noted by the appellant, *supra*, his specification includes a section describing overlays. (Spec. at 386-406.) As noted by the examiner, *supra*, page 395 of that section discloses that "[t]he combining circuit can be a series of tristate multiplexers for overlaying. . . ." Regarding the presence or absence of working examples, "overlays have been demonstrated with the BASIC PROGRAM LISTING LD.ASC. . . ." (*Id.* at 389.)

In view of the aforementioned factors, we are unpersuaded that the specification would not have enabled one skilled in the art to perform overlaying. Therefore, we reverse the enablement rejection of claims 128, 151, 156, 175, 434, 500, 503-505, and 507-514. Regarding claims 170, 506, and 515, however, we have further a point of contention to consider, *infra*.

d. Pull-down Menu

Regarding claims 170, 279, 319, 370, 506, and 515, (Examiner's Answer at 77), the examiner makes the following assertion.

[S]ince there is no mention in the originally filed specification of a "pull-down menu" or anything shown in the drawings of a "pull-down menu" and the only thing resembling a menu is not a "pull-down menu" as known in the art, one of ordinary skill in the art would face an undue amount of experimentation and delay in trying to make or use the claimed invention.

(*Id.* at 79.)

The written description requirement and the enablement requirement are "separate and distinct" requirements. *Vas-Cath*, 935 F.2d at 1563, 19 USPQ2d at 1117. "A specification may contain a disclosure that is sufficient to enable one skilled in the art to make and use the invention and yet fail to comply with the description of the invention requirement." *In re Barker*, 559 F.2d 588, 591, 194 USPQ 470 472 (CCPA 1977) (citing *Fields v. Conover*, 58 CCPA 1366, 1372, 443 F.2d 1386, 1391, 170 USPQ 276, 280 (1971); *In re Ruschig*, 379 F.2d 990, 995-96, 154 USPQ 118, 123 (1967)).

Here, we agree with the examiner's finding, *supra*, that the appellant's original specification fails to mention or show a "pull-down" menu. Nonetheless, the claims at issue are broad. For example, claim 170 merely recites in pertinent part the following limitations: "generating first pull-down menu information in response to the operator

input information," i.e., a broad step of generating a pull-down menu in response to input from a user. Concerning the nature of the invention, we agree with the appellant that these limitations are "no[t] complex claim limitations that would challenge a programmer or a display engineer." (Reply Br. at 90.) Relevant to the state of the prior art, the examiner admits that "[t]he term 'pull-down menu' had a definite meaning in the art as evidenced by the US patent number 4,464,652 to Lapson et al," (Examiner's Answer at 78), and "[t]his reference shows the use of an actual 'pull-down menu'. . . ." (*Id.*)

In view of the aforementioned factors, we are unpersuaded that one skilled in the art would not have been able to generate a pull-down menu in response to input from a user without undue experimentation. Therefore, we reverse the enablement rejection of claims 170, 319, 370, 506; and 515. Regarding claim 279, however, we have further a point of contention to consider, *infra*.

e. Icon

Regarding claims 159 and 279, (Examiner's Answer at 80), the examiner asserts, "[t]he mere single mention of the term 'icon' does not describe or enable how 'icon image information' is generated nor how the generated 'icon image information' is

overlaid 'onto the window of three dimensional perspective image information'. . . ."

(*Id.*) The appellant quotes from page 410 of his specification. (Reply Br. at 24.)

The claims at issue are broad. For example, claim 159 merely recites in pertinent part the following limitations: "generating icon image information; and overlaying the icon image information onto the window of three dimensional perspective image information," i.e., a broad step of generating an icon and overlaying it onto a window showing a 3D image. Regarding the amount of direction or guidance presented, as noted by the appellant, *supra*, his specification mentions that "terrain primitives stored in the database," (Spec. at 410), can include icons. (*Id.*)

In view of the aforementioned factors, we are unpersuaded that one skilled in the art would not have been able to generate an icon and overlaying it onto a window showing a 3D image without undue experimentation. Therefore, we reverse the enablement rejection of claims 159 and 279.

f. Programming

Regarding claim 172, (Examiner's Answer at 53), the examiner makes the following assertion.

[G]iven the complete lack of a written description of the claimed subject matter, especially a written description showing the claim elements being

connected and responsive as claimed, much less showing how the claimed elements are coupled and responsive to one another (e.g., what type of couplings are used, how are the elements coupled, what acts are actually responded to in the in response to language, etc.), one of ordinary skill would be starting with a clean design slate, and therefore would require the amount of experimentation required to actually invent the claimed subject matter in the first place; and this amount of experimentation is necessarily undue.

(*Id.*) The appellant argues, "[a] program is coded in sequence and the computer executes it in sequence. Thus, adjacencies between instructions constitute 'interconnections and interrelations' and the progression of program execution by the computer." (Reply Br. at 140.)

Concerning the nature of the invention, we agree with the appellant that "there are no complex claim limitations that would challenge a programmer or a display engineer." (*Id.* at 90.) Relevant to the state of the prior art, we agree with the appellant's following assertions.

A program is coded in sequence and the computer executes it in sequence. Thus, adjacencies between instructions constitute "interconnections and interrelations" and the progression of program execution by the computer. Computer programs also contain non-sequential instructions; branch instructions, jump instructions, subroutine call instructions, return from subroutine instructions, and the like. These non-sequential instructions are well defined in the art. Branch instructions, jump instructions, and subroutine call instructions identify the destination by address, mnemonic, or the like embedded in the instruction. Return instructions return to the program location from which they came.

(*Id.* at 140.) For their part, neither Marsh nor Lapson discloses more programming specifics that those offered by the appellant.

In view of the aforementioned factors, we are unpersuaded that the specification would not have enabled one skilled in the art to program the limitations of claim 172. Therefore, we reverse the enablement rejection of that claim.

2. *Claims 131, 134, 139, 194, 196, 199, 202, 210, 236, 250, 252, 255, 266, 274, 276, 282, 287, 290, 298, 306, 314, 316, 322, 375, 376, 381, 385, 390, 394, 399, 400, 405, 410, 415, 420, 428, 429 439, 443, 444, 449, 454, 459, 463, 467, 472, 477, 482, 487, 491, 496, 501, and 516-522*

Although the examiner includes claims 131, 134, 139, 194, 196, 199, 202, 210, 236, 250, 252, 255, 266, 274, 276, 282, 287, 290, 298, 306, 314, 316, 322, 375, 376, 381, 385, 390, 394, 399, 400, 405, 410, 415, 420, 428, 429 439, 443, 444, 449, 454, 459, 463, 467, 472, 477, 482, 487, 491, 496, 501, and 516-522 in his statement of the enablement rejection, (Examiner's Answer at 46-47), his explanation of the rejection, (*id.* at 47-81), fails to address any of these claims. We will not "resort to speculation," *In re Warner*, 379 F.2d 1011, 1017, 154 USPQ 173, 178 (CCPA 1967), as to the examiner's position. Therefore, we reverse the enablement rejection of claims 131, 134, 139, 194, 196, 199, 202, 210, 236, 250, 252, 255, 266, 274, 276, 282, 287, 290, 298, 306, 314, 316, 322, 375, 376, 381, 385, 390, 394, 399, 400, 405, 410, 415, 420,

428, 429 439, 443, 444, 449, 454, 459, 463, 467, 472, 477, 482, 487, 491, 496, 501,
and 516-522.

3. *Claims* 126, 129, 130, 132, 135, 152, 157, 160, 168, 169, 171, 173, 174, 176, 177, 195, 197, 200, 211, 221, 222, 235, 237, 238, 251, 253, 254, 256, 267, 269, 272, 273, 275, 277, 280, 283, 285, 288, 289, 291, 299, 307, 315, 317, 318, 320, 321, 323, 329-332, 334-336, 338-341, 343-346, 348-369, 371, 373, 374, 377, 379, 380, 382, 383, 384, 386, 388, 389, 391, 393, 395, 397, 398, 401-404, 406, 408, 409, 411, 413, 414, 416-419, 421, 423, 425, 427, 430, 432, 433, 435-438, 440, 442, 445, 447, 448, 450, 452, 453, 455, 457, 458, 460-462, 464, 466, 468-471, 473-476, 478, 480, 481, 483-486, 488, 490, 492, 494, 495, and 497-499

The examiner asserts, "[t]he specification provides no guidance as to how these products are made or what these products are intended to be. Without any guidance from the originally filed specification, one of ordinary skill in the art would be burdened with undue experimentation or delay in trying to make and use the claimed invention." (Examiner's Answer at 65.) The appellant argues, "the instant application provides many 'working examples;" (Reply Br. at 134), "these 'working examples' establish enablement. . . ." (*Id.*)

In addressing the written description rejection, *supra*, we found that claims 126, 129, 130, 132, 135, 152, 157, 160, 168, 169, 171, 173, 174, 176, 177, 195, 197, 200, 211, 221, 222, 235, 237, 238, 251, 253, 254, 256, 267, 269, 272, 273, 275, 277, 280, 283, 285, 288, 289, 291, 299, 307, 315, 317, 318, 320, 321, 323, 329-332, 334-336,

338-341, 343-346, 348-369, 371, 373, 374, 377, 379, 380, 382, 383, 384, 386, 388, 389, 391, 393, 395, 397, 398, 401-404, 406, 408, 409, 411, 413, 414, 416-419, 421, 423, 425, 427, 430, 432, 433, 435-438, 440, 442, 445, 447, 448, 450, 452, 453, 455, 457, 458, 460-462, 464, 466, 468-471, 473-476, 478, 480, 481, 483-486, 488, 490, 492, 494, 495, and 497-499 each refer to the disclosed making of static photographs.

We are not persuaded that the specification would not have enabled one skilled in the art to make static photographs without undue experimentation. Therefore, we reverse the enablement rejection of claims 126, 129, 130, 132, 135, 152, 157, 160, 168, 169, 171, 173, 174, 176, 177, 195, 197, 200, 211, 221, 222, 235, 237, 238, 251, 253, 254, 256, 267, 269, 272, 273, 275, 277, 280, 283, 285, 288, 289, 291, 299, 307, 315, 317, 318, 320, 321, 323, 329-332, 334-336, 338-341, 343-346, 348-369, 371, 373, 374, 377, 379, 380, 382, 383, 384, 386, 388, 389, 391, 393, 395, 397, 398, 401-404, 406, 408, 409, 411, 413, 414, 416-419, 421, 423, 425, 427, 430, 432, 433, 435-438, 440, 442, 445, 447, 448, 450, 452, 453, 455, 457, 458, 460-462, 464, 466, 468-471, 473-476, 478, 480, 481, 483-486, 488, 490, 492, 494, 495, and 497-499.

4. Claims 127, 133, 136, 153, 158, 161, 198, 201, 257, 270, 278, 281, 286, 372, 378, 387, 392, 396, 407, 412, 422, 426, 431, 441, 446, 451, 456, 465, 479, 489, and 493

The examiner asserts, "[t]he specification provides no guidance as to how these products are made or what these products are intended to be. Without any guidance from the originally filed specification, one of ordinary skill in the art would be burdened

with undue experimentation or delay in trying to make and use the claimed invention." (Examiner's Answer at 65.) The appellant argues, "the instant application provides many 'working examples;" (Reply Br. at 134). "these 'working examples' establish enablement. . . ." (*Id.*)

In addressing the written description rejection, *supra*, we found no showing that the specification describes either the meaning of the claimed products or the act of making the products. Without knowing the identity of the claimed products, we are not persuaded that the specification would have enabled one skilled in the art to make and use the claimed products without undue experimentation. Therefore, we affirm the enablement rejection of claims 127, 133, 136, 153, 158, 161, 198, 201, 257, 270, 278, 281, 286, 372, 378, 387, 392, 396, 407, 412, 422, 426, 431, 441, 446, 451, 456, 465, 479, 489, and 493.

C. OBVIOUSNESS REJECTION

At the outset, the examiner finds, "Marsh is concerned with the display of image information. . . ." (Examiner's Answer at 89.) The appellant argues, "Marsh is non-analogous with the instant claimed invention — Marsh shows a graphics (polygon) flight simulator system while the instant claimed invention is directed to an operator interactive window display system." (Reply Br. at 147.)

"Whether a reference in the prior art is 'analogous' is a fact question." *In re Clay*, 966 F.2d 656, 658, 23 USPQ2d 1058, 1060 (Fed. Cir. 1992) (citing *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1568 n.9, 1 USPQ2d 1593, 1597 n.9 (Fed. Cir. 1987)). Two criteria have evolved for answering the question: "(1) whether the art is from the same field of endeavor, regardless of the problem addressed, and (2) if the reference is not within the field of the inventor's endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved." *Id.* at 658-59, 23 USPQ2d at 1060 (citing *In re Deminski*, 796 F.2d 436, 442, 230 USPQ 313, 315 (Fed. Cir. 1986); *In re Wood*, 599 F.2d 1032, 1036, 202 USPQ 171, 174 (CCPA 1979)).

Here, regarding the first criterion, the appellant states that "[t]he field of the present invention is display and machine vision systems and, in particular, image processing systems." (Spec. at 3.) Similarly, Marsh "relates to an imaging system for displaying objects. . . ." Col. 1, ll. 7-8.

The appellant also discloses that his invention includes a flight simulation application. (Spec. at 466.) Similarly, Marsh's invention concerns "a flight simulation system. . . ." Col. 2, l. 22. Because the inventions of the appellant and the reference are both from the field of display systems, imaging systems, or flight simulators, we find

that Marsh is analogous art. With this analogousness in mind, we address the obviousness of the claims in the following order:

- claims 125-136, 139, 156-158, 170-174, 194-202, 210, 211, 250-257, 266-278, 282, 283, 287-291, 298, 299, 306, 307, 314-323, 329-332, 335, 339, 340, 343-346, 351-358, 360, 362-414, 420-506, 508, 509, and 511-522
- claims 175-177 and 341
- claims 151-153 and 334
- claims 159-161, 236-238, 279-281, 336, 350, 359, 415-419, 507, and 510
- claims 167-169, 220-222, 234, 235, 284-286, 338, 348, 349, and 361.

1. Claims 125-136, 139, 156-158, 170-174, 194-202, 210, 211, 250-257, 266-278, 282, 283, 287-291, 298, 299, 306, 307, 314-323, 329-332, 335, 339, 340, 343-346, 351-358, 360, 362-414, 420-506, 508, 509, and 511-522

Rather than reiterate the positions of the examiner or the appellant *in toto*, we focus on the point of contention therebetween. The examiner makes the following assertions:

As shown in Figure 2A, Image Window 262 is at the base of the Pyramid of Vision. As explained in column 16, at line 42, element 260 is also a window, which overlaps window 262 in Figure 2A. Additionally, each window is also defined by the distance Vz (column 16, line 57). Therefore, within the Pyramid of Vision, for each distance Vz, there is a corresponding window. These windows are displayed (via CRT's 82 in Figure 1) since they correspond to the Pyramid of Vision, and all generated image information is displayed in them.

(Examiner's Answer at 85-86.) The appellant argues, "Marsh's elements 260 and 262 are . . . no[t] the claimed **multiple** overlaid 'windows'. These are parts of a cartoon of a 'pyramid of vision' showing a single image plane." (Reply Br. at 180.)

In addressing the point of contention, the Board conducts a two-step analysis. First, we construe claims at issue to determine their scope. Second, we determine whether the construed claims would have been obvious.

a. Claim Construction

Independent claim 125 recites in pertinent part the following limitations:

"displaying a first window containing the first data decompressed image information **and displaying a second window** containing the irregularly cropped overlaid information." (Emphases added.) Independent claims 128, 131, 134, 139, 156, 170, 172, 194, 196, 199, 202, 210, 250, 252, 255, 266, 268, 271, 274, 276, 282, 287, 290, 298, 306, 314, 316, 319, 322, 370, 375, 381, 385, 390, 394, 399, 405, 410, 420, 424, 428, 434, 439, 443, 449, 454, 459, 463, 467, 472, 477, 482, 487, 491, 496, 500, 501, 502, 503, 504, 505, 506, 508, 509, 511, 512, 513, and 515 recite similar limitations.⁵

Considering these limitations, claims 125, 128, 131, 134, 139, 156, 170, 172, 194, 196,

⁵Although the appellant asserts that claims 167, 175, and 279 also "hav[e] multiple 'windows'-related limitations," (Reply Br. at 185 n. 96), we observe no recitation of more than one window in any of these three claims.

199, 202, 210, 250, 252, 255, 266, 268, 271, 274, 276, 282, 287, 290, 298, 306, 314, 316, 319, 322, 370, 375, 381, 385, 390, 394, 399, 405, 410, 420, 424, 428, 434, 439, 443, 449, 454, 459, 463, 467, 472, 477, 482, 487, 491, 496, 500, 501, 502, 503, 504, 505, 506, 508, 509, 511, 512, 513, and 515 require simultaneously displaying plural windows on the same screen.

b. Obviousness Determination

Having determined what subject matter is being claimed, the next inquiry is whether the subject matter would have been obvious. "In rejecting claims under 35 U.S.C. Section 103, the examiner bears the initial burden of presenting a *prima facie* case of obviousness." *In re Rijckaert*, 9 F.3d 1531, 1532, 28 USPQ2d 1955, 1956 (Fed. Cir. 1993) (citing *In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992)). "A *prima facie* case of obviousness is established when the teachings from the prior art itself would appear to have suggested the claimed subject matter to a person of ordinary skill in the art." *In re Bell*, 991 F.2d 781, 783, 26 USPQ2d 1529, 1531 (Fed. Cir. 1993) (quoting *In re Rinehart*, 531 F.2d 1048, 1051, 189 USPQ 143, 147 (CCPA 1976)).

Here, we find that Marsh discloses a single window, viz., "image widow 262." Col. 16, l. 40. "[A] prior patent must be considered in its entirety, i.e., as a *whole*,

including portions that would lead away from the invention. . . ." *Panduit Corp.*, 810 F.2d 1561 at 1568, 1 USPQ2d at 1597 (citing *W.L. Gore & Assocs., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1550, 220 USPQ 303, 311 (Fed. Cir. 1983)). Although the first passage of the reference cited by the examiner mentions a "window 260," col. 16, l. 42, Figures 2A and 2B of Marsh show that the latter "window" is merely the V_z plane of the image window 262. The Figures further show that the image window 262 comprises a single V_z plane, rather than the plurality of V_z planes alluded to by the examiner.

The examiner does not allege, let alone show, that the addition of Netravali or Lapson cures the aforementioned deficiency of Marsh. Absent a teaching or suggestion of simultaneously displaying plural windows on the same screen, we are unpersuaded of a *prima facie* case of obviousness. Therefore, we reverse the obviousness rejection of claim 125; of claims 126, 127, and 329, which depend therefrom; of claim 128; of claims 129, 130, and 330, which depend therefrom; of claim 131; of claims 132, 133, and 331, which depend therefrom; of claim 134; of claims 135, 136, and 332, which depend therefrom; of claim 139; of claim 156; of claim 170; of claims 171 and 339, which depend therefrom; of claim 172; of claims 173, 174, and 340, which depend therefrom; of claim 194; of claims 195 and 343, which depend therefrom; of claim 196; of claims 197, 198, and 344, which depend therefrom; of claim 199; of claims 200, 201, and 345, which depend therefrom;

of claim 202; of claim 210; of claims 211 and 346, which depend therefrom; of claim 250; of claims 251 and 351, which depend therefrom; of claim 252; of claims 253, 254, and 352, which depend therefrom; of claim 255; of claims 256, 257, and 353, which depend therefrom; of claim 266; of claims 267 and 354, which depend therefrom; of claim 268; of claims 269, 270 and 355, which depend therefrom; of claim 271; of claims 272, 273, and 356, which depend therefrom; of claim 274; of claims 275 and 357, which depend therefrom; of claim 276; of claims 277, 278, and 358, which depend therefrom; of claim 282; of claims 283 and 360, which depend therefrom; of claim 287; of claims 288, 289, and 362, which depend therefrom; of claim 290; of claims 291 and 363, which depend therefrom; of claim 298; of claims 299 and 364, which depend therefrom; of claim 306; of claims 307 and 365, which depend therefrom; of claim 314; of claims 315 and 366, which depend therefrom; of claim 316; of claims 317, 318, and 367, which depend therefrom; of claim 319; of claims 320, 321, and 368, which depend therefrom; of claim 322; of claims 323 and 369, which depend therefrom; of claim 370; of claims 371-374, which depend therefrom; of claim 375, of claims 376-380, which depend therefrom; of claim 381; of claims 382-384, which depend therefrom; of claim 385; of claims 386-389, which depend therefrom; of claim 390; of claims 391-393, which depend therefrom; of claim 394; of claims 395-398, which depend therefrom; of claim 399; of claims 400-404, which depend therefrom; of claim 405; of claims 406-409, which depend therefrom; of claim 410; of claims 411-414, which depend therefrom; of

claim 420; of claims 421-423, which depend therefrom; of claim 424; of claims 425-427, which depend therefrom; of claim 428; of claims 429-433, which depend therefrom; of claim 434; of claims 435-438, which depend therefrom; of claim 439; of claims 440-442, which depend therefrom; of claim 443; of claims 444-448, which depend therefrom; of claim 449; of claims 450-453, which depend therefrom; of claim 454; of claims 455-458, which depend therefrom; of claim 459; of claims 460-462, which depend therefrom; of claim 463; of claims 464-466, which depend therefrom; of claim 467; of claims 468-471, which depend therefrom; of claim 472; of claims 473-476, which depend therefrom; of claim 477; of claims 478-481, which depend therefrom; of claim 482; of claims 483-486, which depend therefrom; of claim 487; of claims 488-490, which depend therefrom; of claim 491; of claims 492-495, which depend therefrom; of claim 496; of claims 497-499, which depend therefrom; of claim 500; of claim 501; of claim 502; of claim 503; of claim 504; of claim 505; of claim 506; of claim 508; of claim 509; of claim 511; of claim 512; of claim 513; of claim 514, which depends therefrom; of claim 515, and of claims 516-522, which depend therefrom.

2. Claims 175-177 and 341

Although the appellant summarizes what claims 176, 177, and 341 cover, (Supp. Appeal Br. at 35, 36, 88, and 89), this does not constitute an argument why the claims are separately patentable. Merely alleging that the examiner's rejection does not

establish the "obviousness of this combination of limitations, nor the obviousness of the recited cooperation between limitations in th[ese] claim[s]," (*id.*), moreover, does not challenge the rejection of the individual claims with any reasonable specificity.

Therefore, claims 176, 177, and 341 stand or fall with representative claim 175.

The examiner finds, "[a]s shown in Figure 2A, Image Window 262 is at the base of the Pyramid of Vision." (Examiner's Answer at 85.) The appellant argues, "finding the term 'window' in Marsh does not support the § 103 rejection because the claims recite different types of windows and the claims recite much more than merely a window." (Reply Br. at 172.)

a. Claim Construction

"[T]he Board must give claims their broadest reasonable construction. . . ." *In re Hyatt*, 211 F.3d 1367, 1372, 54 USPQ2d 1664, 1668 (Fed. Cir. 2000). "Moreover, limitations are not to be read into the claims from the specification." *In re Van Geuns*, 988 F.2d 1181, 1184, 26 USPQ2d 1057, 1059 (Fed. Cir. 1993) (citing *In re Zletz*, 893 F.2d 319, 321, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989)).

Here, claim 175 recites in pertinent part the following limitations: "generating a window of three dimensional perspective image information. . . ." Giving the

representative claim its broadest, reasonable construction, the limitations require generating a window showing a 3D image.

b. Obviousness Determination

The question of obviousness is "based on underlying factual determinations including . . . what th[e] prior art teaches explicitly and inherently. . . ." *In re Zurko*, 258 F.3d 1379, 1383, 59 USPQ2d 1693, 1696 (Fed. Cir. 2001) (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17-18, 148 USPQ 459, 467 (1966); *In re Dembiczak*, 175 F.3d 994, 998, 50 USPQ 1614, 1616 (Fed. Cir. 1999); *In re Napier*, 55 F.3d 610, 613, 34 USPQ2d 1782, 1784 (Fed. Cir. 1995)).

Here, we find that Marsh generates a window, viz., "image widow 262." Col. 16, l. 40. As shown in Figure 2A of the reference, moreover, the image window 262 depicts a "3D HANGER 240" *inter alia*. Because Marsh's image window depicts a 3D image of a hanger, we find that the reference generates a window showing a 3D image.

Therefore, we affirm the obviousness rejection of claim 175 and of claims 176, 177, and 341, which fall therewith.

3. Claims 151-153 and 334

Although the appellant summarizes what claims 152, 153, and 334 cover, (Supp. Appeal Br. at 24, 25, 85), this does not constitute an argument why the claims are separately patentable. Merely alleging that the examiner's rejection does not establish the "obviousness of this combination of limitations, nor the obviousness of the recited cooperation between limitations in th[ese] claim[s]," (*id.*), moreover, does not challenge the rejection of the individual claims with any reasonable specificity. Therefore, claims 152, 153, and 334 stand or fall with representative claim 151.

The examiner finds, "for pull-down type menus, a cursor needs to be used to select the appropriate function. This is clearly taught by Lapson (US Patent Number 4,464,652), in reference to the menu information (e.g., column 6, lines 20-39)." (Examiner's Answer at 89-90.) The appellant argues, "the facts (1) that this 'cursor' limitation had such significant advantages and (2) that Netravali and Marsh did not utilize it both establish the non-obviousness of this 'cursor' limitation." (Reply Br. at 215.)

a. Claim Construction

Claim 151 recites in pertinent part the following limitations: "generating cursor information. . . ." Giving the representative claim its broadest, reasonable construction, the limitations require displaying a cursor on a screen.

b. Obviousness Determination

"Non-obviousness cannot be established by attacking references individually where the rejection is based upon the teachings of a combination of references." *In re Merck*, 800 F.2d, 1091, 1097, 231 USPQ 375, 380 (Fed. Cir. 1986) (citing *In re Keller*, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981)). "Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art." *Cable Elec. Prods., Inc. v. Genmark, Inc.*, 770 F.2d 1015, 1025, 226 USPQ 881, 886-87 (Fed. Cir. 1985) (quoting *Keller*, 642 F.2d at 425, 208 USPQ at 881).

Here, the rejection is based on the combined teachings of Marsh, Netravali, and Lapson. For its part, the latter reference discloses "[a] cursor control device having particular application for use in conjunction with a computer display system. . . ." Col. 3, ll. 4-5. The cursor control device 20 "is coupled to a display system which is controlled by a computer or other equivalent circuitry. Appropriate programming of the computer is provided such that a 'menu' bar 100 comprising a variety of command options

indicated by titles (for example, $T_1, T_2, T_3 \dots T_n$), is displayed across the CRT screen. . . . " Col. 5, l. 68 - col. 6, l. 4. "If a particular title (for example T_1) is selected, one or more sub-command items 104 are displayed by the computer system below the primary menu title. As illustrated, the sub-command items appear to the user to be 'pulled down' from the main menu bar 100." Col. 6, ll. 4-9.

"A user desiring to select a particular title moves cursor control unit 20 over a surface, thereby . . . sending signals indicative of X-Y locations to the display system for corresponding movement of a cursor or the like on the display screen." *Id.* at ll. 20-25, We find that such a movement of a cursor displays the cursor on the screen. Therefore, we affirm the obviousness rejection of claim 151 and of claims 152, 153, and 334, which fall therewith.

4. Claims 159-161, 236-238, 279-281, 336, 350, 359, 415-419, 507, and 510

The examiner asserts, "Marsh discloses generating information regarding objects such as towers, hangers, moving objects, etc. (column 2, lines 39-41) as well as cultural objects such as signal beacons and runway lamps (column 7, lines 24-25). These are graphical representations of the objects, and as such are icons." (Examiner's Answer at 90.) The appellant argues, "[t]he 'objects such as towers, hangers, moving objects, etc.' are not disclosed by Marsh as being icons. . . ." (Reply Br. at 216.)

a. Claim Construction

"The general rule is, of course, that terms in the claim are to be given their ordinary and accustomed meaning." *Johnson Worldwide Assocs., Inc. v. Zebco Corp.*, 175 F.3d 985, 989, 50 USPQ2d 1607, 1610 (Fed. Cir. 1999) (citing *Renishaw PLC v. Marposs Societa Per Azioni*, 158 F.3d 1243, 1249, 48 USPQ2d 1117, 1121 (Fed. Cir. 1998); *York Prods., Inc. v. Central Tractor Farm & Family Ctr.*, 99 F.3d 1568, 1572, 40 USPQ2d 1619, 1622 (Fed. Cir. 1996)). "It is well settled that dictionaries provide evidence of a claim term's 'ordinary meaning.'" *Inverness Med. Switz. GmbH v. Warner Lambert Co.*, 309 F.3d 1365, 1369, 64 USPQ2d 1926, 1930 (Fed. Cir. 2002) (citing *Texas Digital Sys. Inc. v. Telegenix Inc.*, 308 F.3d 1193, 1202, 64 USPQ2d 1812, 1818 (Fed. Cir. 2002); *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366, 62 USPQ2d 1658, 1662 (Fed. Cir. 2002)).

Here, independent claims 159, 236, 279, 415, 507, and 510 recite in pertinent part the following limitations: "generating icon image information. . . ." The ordinary meaning of the term "icon" is "a small graphics image displayed on the screen to represent an object that can be manipulated by the user." *Microsoft Press Computer Dictionary* 205 (2d ed. 1994). Giving the term its ordinary meaning, the limitations require displaying a small graphics image on a screen to represent an object that can be manipulated by a user.

b. Obviousness Determination

For its part, Marsh may display "runaways, towers, hangers, roads, rivers, fields, moving objects, etc.," col. 2, ll. 40-41, and "cultural objects such as signal beacons and runway lamps. . . ." Col. 7, ll. 24-25. Because the examiner has not shown that such objects can be manipulated by a user, however, we are unpersuaded that the reference's objects constitute icons.

The examiner does not allege, let alone show, that the addition of Netravali or Lapson cures the aforementioned deficiency of Marsh. Absent a teaching or suggestion of displaying a small graphics image on a screen to represent an object that can be manipulated by a user, we are unpersuaded of a *prima facie* case of obviousness. Therefore, we reverse the obviousness rejection of claim 159; of claims 160, 161, and 336, which depend therefrom; of claim 236; of claims 237, 238, and 350, which depend therefrom; of claim 279; of claims 280, 281, and 359, which depend therefrom; of claim 415; of claims 416-419, which depend therefrom; of claim 507; and of claim 510.

5. Claims 167-169, 220-222, 234, 235, 284-286, 338, 348, 349, and 361

The examiner asserts, "Marsh further discloses generating irregularly cropped image information by cropping to an irregular outline in response to the second three

dimensional perspective data decompressed image information (column 14, lines 44-48 and 56-60)." (Examiner's Answer at 84.) He adds, "Marsh teaches making a face (of an object) invisible if it is in back of another face (e.g., of a building) (column 13, lines 53-56), using an occulting technique." (*Id.* at 85.) The appellant argues, "Marsh performs what the Examiner contends is the overlaying (Marsh's 'back side' 'occulting', Col. 13:55-56) before clipping the image to 'the four sides of the aircraft window'." (Reply Br. at 191.)

a. Claim Construction

"The Patent and Trademark Office (PTO) must consider all claim limitations when determining patentability of an invention over the prior art." *In re Lowry*, 32 F.3d 1579, 1582, 32 USPQ2d 1031, 1034 (Fed. Cir. 1994) (citing *In re Gulack*, 703 F.2d 1381, 1385, 217 USPQ 401, 403-04 (Fed. Cir. 1983)).

Here, independent claims 167 and 284 recite in pertinent part the following limitations:

generating irregularly cropped video image information by cropping to an irregular outline in response to the second data decompressed video image information;

generating irregularly cropped textured video image information by texturing in response to the irregularly cropped video image information;

generating irregularly cropped overlaid video image information by overlaying in response to the irregularly cropped textured video image information and in response to the background video image information. .

Similarly, independent claims 220 and 234 recite in pertinent part the following limitations:

generating irregularly cropped image information by cropping to an irregular outline in response to the second data decompressed image information;

generating irregularly cropped textured image information by texturing in response to the irregularly cropped image information;

generating irregularly cropped overlaid image information by overlaying in response to the irregularly cropped textured image information and in response to the background image information. . . .

Considering these limitations, claims 167, 220, 234, and 284 require **first** cropping an image and **then** overlaying the cropped image onto a background image.

b. Obviousness Determination

The examiner reads the claimed cropping on "column 14, lines 44-48 and 56-60," (Examiner's Answer at 84), of Marsh. For its part, this passage discloses a "clipping stage 63 which eliminates points outside the viewing volume or pyramid of vision 250 shown in FIG. 2a." Col. 14, ll. 42-44. The examiner further reads the claimed overlaying on "column 13, lines 53-56," (*id.* at 85), of the reference. For its

part, the latter passage describes "a simple occulting technique," col. 13, ll. 56-57, performed by "rotation circuitry," *id.* at l. 39, of a "rotation stage 62." Col. 12, l. 52. Assuming *arguendo* that Marsh's clipping stage 63 crops an image, and its rotation stage 62 overlays an image onto a background image, we are unpersuaded that the reference **first** crops an image and **then** overlays the cropped image onto a background image. To the contrary, Figure 1 of Marsh shows that the rotation stage 62 performs its operations **before** the clipping stage 63 performs its functions.

The examiner does not allege, let alone show, that the addition of Netravali or Lapson cures the aforementioned deficiency of Marsh. Absent a teaching or suggestion of **first** cropping an image and **then** overlaying the cropped image onto a background image, we are unpersuaded of a *prima facie* case of obviousness. Therefore, we reverse the obviousness rejection of claim 167; of claims 168, 169, and 338, which depend therefrom; of claim 220; of claims 221, 222, and 348, which depend therefrom; of claim 234; of claims 235 and 349, which depend therefrom; of claim 284; of claims 285, 286, and 361, which depend therefrom.

CONCLUSION

In summary, the rejection of claims 125-136, 139, 151-153, 156-161, 167-177, 194-202, 210, 211, 220-222, 234-238, 250-257, 266-291, 298, 299, 306, 307, 314-323,

329-332, 334-336, 338-341, 343-346, and 348-522 under § 112, ¶ 1, as lacking a written description rejection is affirmed. The rejection of claims 125, 126, 128-132, 134, 135, 139, 151, 152, 156, 157, 159, 160, 167-177, 194-197, 199-200, 202, 210, 211, 220-222, 234-238, 250-256, 266-269, 271-277, 279, 280, 282-285, 287-291, 298, 299, 306, 307, 314-323, 329-332, 334-336, 338-341, 343-346, 348-371, 373-377, 379-386, 388-391, 393-395, 397-406, 408-411, 413-421, 423-425, 427-430, 432-440, 442-445, 447-450, 452-455, 457-464, 466-478, 480-488, 490-492, and 494-522 under § 112, ¶ 1, as non-enabled is reversed. In contrast, the rejection of claims 127, 133, 136, 153, 158, 161, 198, 201, 257, 270, 278, 281, 286, 372, 378, 387, 392, 396, 407, 412, 422, 426, 431, 441, 446, 451, 456, 465, 479, 489, and 493 under § 112, ¶ 1, as non-enabled is affirmed.

The rejections of claims 125-136, 139, 156-161, 167-174, 194-202, 210, 211, 220-222, 234-238, 250-257, 266-291, 298, 299, 306, 307, 314-323, 329-332, 335, 336, 338-340, 343-346, and 348-522 under § 103(a) is reversed. In contrast, the rejection of claims 151-153, 175-177, 334, and 341 under § 103(a) is affirmed.

"Any arguments or authorities not included in the brief will be refused consideration by the Board of Patent Appeals and Interferences. . . ." 37 C.F.R. § 1.192(a). Accordingly, our affirmance is based only on the arguments made in the

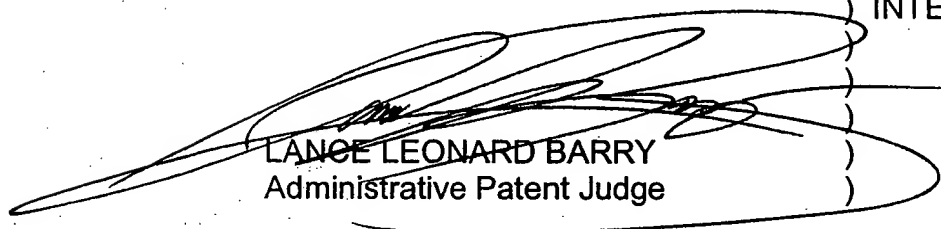
briefs. Any arguments or authorities omitted therefrom are neither before us nor at issue but are considered waived. *Cf. In re Watts*, 354 F.3d 1362, 1367, 69 USPQ2d 1453, 1457 (Fed. Cir. 2004) ("[I]t is important that the applicant challenging a decision not be permitted to raise arguments on appeal that were not presented to the Board.") No time for taking any action connected with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED


KENNETH W. HAIRSTON
Administrative Patent Judge


ANITA PELLMAN GROSS
Administrative Patent Judge

) BOARD OF PATENT
) APPEALS
) AND
) INTERFERENCES


LANCE LEONARD BARRY
Administrative Patent Judge

Appeal No. 2004-0353
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**Ex parte Hyatt, Decision on Appeal No. 2003-0525,
in patent application Serial No. 08/457,728
(PTO Bd. App. July 30, 2004) (unpublished PTO decision)**

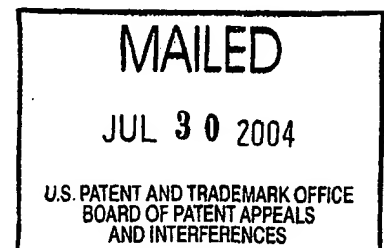
UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte GILBERT P. HYATT

Appeal No. 2003-0525
Application No. 08/457,728

HEARD: July 15, 2004



Before BARRETT, FLEMING, and BARRY, *Administrative Patent Judges*.
BARRY, *Administrative Patent Judge*.

DECISION ON APPEAL

A patent examiner rejected claims 21, 31, 131, 132, 136, 137, 207-209, 219-221, 231-233, 238-240, 259-261, 278-280, 409-614, 625-663, 668-681, and 687-771. The appellant appeals therefrom under 35 U.S.C. § 134(a). We affirm.

BACKGROUND

The invention at issue on appeal relates to image processing. A further understanding of the invention can be achieved by reading the following claims.

21. An image processing system comprising:

an input circuit generating input image information;

a memory coupled to the input circuit and storing an image in response to the input image information generated by the input circuit;

an accessing circuit coupled to the memory and accessing the image from the memory; and

a display processor coupled to the accessing circuit and generating a plurality of frames of data compressed rotated and translated images by rotation and translation processing of the image accessed by the accessing circuit.

31. An image processing system comprising:

a database memory storing a database image;

an image memory storing a portion of the database image;

a look ahead circuit generating look ahead information;

an image memory loading circuit coupled to the database memory and coupled to the image memory and loading the portion of the database image stored by the database memory into the image memory; and

an image processor coupled to the image memory and coupled to the look ahead circuit, the image processor generating a processed image by processing the portion of the database image stored in the image memory in response to the look ahead information generated by the look ahead circuit.

476. A process comprising the acts of:

storing a database comprising a plurality of data compressed frames of topographical altitude information, each of a plurality of the data compressed frames of topographical altitude information comprising a plurality of data compressed blocks of topographical altitude information, each of a plurality of the data compressed blocks of topographical altitude information representing a data compressed block of topographical altitude information;

generating an accessed data compressed frame of topographical altitude information in response to the plurality of data compressed frames of topographical altitude information, the accessed data compressed frame of topographical altitude information comprising a plurality of accessed data compressed blocks of topographical altitude information, each of a plurality of the accessed data compressed blocks of topographical altitude information representing an accessed data compressed block of topographical altitude information;

generating a data decompressed frame of topographical altitude information in response to the accessed data compressed frame of topographical altitude information, the data decompressed frame of topographical altitude information comprising a plurality of data decompressed blocks of topographical altitude information; and

displaying a topographically shadowed image in response to the plurality of data decompressed blocks of topographical altitude information.

Claims 441, 443, 447, 450, 456, 462, 466, 473, 479, 483, 486, 490, 492, 497, 500, 502, 506, 511, 514, 521, 527, 530, 533, 536, 538, 542, 545, 551, 558, 563, 570, 576, 579, 582, 585, 590, 593, 598, 603, 606, 612, 627, 635, 638, 642, 647, 650, 653, 662, 674, 679, 690, 693, 700, 704, 707, 711, 717, 719, 723, 728, 733, 736, 740, 744, 748, 750, 755, 758, and 763 stand rejected under 35 U.S.C. § 112, ¶ 2, as indefinite. Claims 21, 31, 131, 132, 136, 137, 207-209, 219-221, 231-233, 238-240, 259-261, 278-280, 409-614, 625-663, 668-681, and 687-771 stand rejected under 35 U.S.C. § 112, ¶ 1, as lacking a written description and under § 112, ¶ 1, as non-enabled. Claims 31, 578-614, 625-638, and 672-675 stand rejected under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 4,179,824 ("Marsh"). Claims 21, 131, 132, 136, 137, 207-209,

219-221, 231-233, 238-240, 259-261, 278-280, 409-577, 639-663, 668-671, 676-681, and 687-771 stand rejected under § 103(a) as obvious over Marsh and U.S. Patent No. 4,302,775 ("Widergren").

OPINION

When claims have been rejected under the first and second paragraphs of 35 U.S.C. § 112, analysis "should begin with the determination of whether the claims satisfy the requirements of the second paragraph." *In re Moore*, 439 F.2d 1232, 1235, 169 USPQ 236, 238 (CCPA 1971). Accordingly, our opinion addresses the rejections in the following order:

- indefiniteness rejection
- written description rejection
- enablement rejection
- obviousness rejection over Marsh
- obviousness rejection over Marsh and Widergren.

A. INDEFINITENESS REJECTION

Rather than reiterate the positions of the examiner or the appellant *in toto*, we focus on the point of contention therebetween. Observing that "[c]laims 441, 443, 447, 450, 456, 462, 466, 473, 479, 483, 486, 490, 492, 497, 500, 502, 506, 511, 514, 521, 527, 530, 533, 536, 538, 542, 545, 551, 558, 563, 570, 576, 579, 582, 585, 590, 593, 598, 603, 606, 612, 627, 635, 638, 642, 647, 650, 653, 662, 674, 679, 690, 693, 700,

704, 707, 711, 717, 719, 723, 728, 733, 736, 740, 744, 748, 750, 755, 758 and 763 each include two references to a parent claim," (Examiner's Answer at 38-39), the examiner asserts, "it is unclear if these claims form an additional step in the process claimed in the parent claim, or if they are directed towards a product formed by the process of the parent claim. . . ." (*Id.* at 39.) The appellant argues that he "has defined what he regards as his invention." (Appeal Br. at 97.)

"There is no hard and fast rule against the double inclusion of claim language." *Doyle v. Crain Industries, Inc.*, 243 F.3d 564 (table), 2000 WL 1608826, at *4 (Fed. Cir. 2000). "Automatic reliance upon a 'rule against double inclusion' will lead to as many unreasonable interpretations as will automatic reliance upon a 'rule allowing double inclusion'. The governing consideration is not *double inclusion*. . . ." *In re Kelly*, 305 F.2d 909, 916, 134 USPQ 397, 402 (CCPA 1962). Rather, "[t]he test for definiteness is whether one skilled in the art would understand the bounds of the claim when read in light of the specification. *Orthokinetics Inc., v. Safety Travel Chairs, Inc.*, 806 F.2d 1565, 1576, 1 USPQ2d 1081, 1088 (Fed. Cir. 1986). If the claims read in light of the specification reasonably apprise those skilled in the art of the scope of the invention, Section 112 demands no more. *Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1385, 231 USPQ 81, 94 (Fed. Cir. 1986)." *Miles Labs., Inc. v. Shandon Inc.*, 997 F.2d 870, 875, 27 USPQ2d 1123, 1126 (Fed. Cir. 1993).

Here, reciting "[a] process as set forth in claim 439, further comprising the act of making a database product in response to the process set forth in claim 439," claim 441 refers twice to the claim from which it depends, viz., claim 439. Similarly, each of claims 443, 447, 450, 456, 462, 466, 473, 479, 483, 486, 490, 492, 497, 500, 502, 506, 511, 514, 521, 527, 530, 533, 536, 538, 542, 545, 551, 558, 563, 570, 576, 579, 582, 585, 590, 593, 598, 603, 606, 612, 627, 635, 638, 642, 647, 650, 653, 662, 674, 679, 690, 693, 700, 704, 707, 711, 717, 719, 723, 728, 733, 736, 740, 744, 748, 750, 755, 758 and 763, refers twice to the claim from which it depends. We are unpersuaded that the two references to the parent claim would prevent one skilled in the art from understanding the bounds of the dependent claims when read in light of the specification. Therefore, we reverse the indefiniteness rejection of claims 441, 443, 447, 450, 456, 462, 466, 473, 479, 483, 486, 490, 492, 497, 500, 502, 506, 511, 514, 521, 527, 530, 533, 536, 538, 542, 545, 551, 558, 563, 570, 576, 579, 582, 585, 590, 593, 598, 603, 606, 612, 627, 635, 638, 642, 647, 650, 653, 662, 674, 679, 690, 693, 700, 704, 707, 711, 717, 719, 723, 728, 733, 736, 740, 744, 748, 750, 755, 758, and 763.

B. WRITTEN DESCRIPTION REJECTION

"[T]o assure separate review by the Board of individual claims within each group of claims subject to a common ground of rejection, an appellant's brief to the Board

must contain a clear statement for each rejection: (a) asserting that the patentability of claims within the group of claims subject to this rejection do not stand or fall together, and (b) identifying which individual claim or claims within the group are separately patentable and the reasons why the examiner's rejection should not be sustained." *In re McDaniel*, 293 F.3d 1379, 1383, 63 USPQ2d 1462, 1465 (Fed. Cir. 2002) (citing 37 C.F.R. §1.192(c)(7) (2001)). "Merely pointing out differences in what the claims cover is not an argument as to why the claims are separately patentable." 37 C.F.R.

§ 1.192(c)(7) (2001). Rather, "[f]or each rejection under 35 U.S.C. 112, first paragraph, the argument shall specify the errors in the rejection and how the first paragraph of 35 U.S.C. 112 is complied with, including, as appropriate, how the specification and drawings, if any, . . . [d]escribe the subject matter defined by each of the rejected claims. . . ." 37 C.F.R. § 1.192(c)(8)(i)(a)(2001).¹ "If the brief fails to meet either requirement, the Board is free to select a single claim from each group of claims subject to a common ground of rejection as representative of all claims in that group and to decide the appeal of that rejection based solely on the selected representative claim." *McDaniel*, 293 F.3d at 1383, 63 USPQ2d at 1465.

¹Regardless of a rejection, "when filing an amendment an applicant should show support in the original disclosure for new or amended claims." M.P.E.P. § 2163.II.3(b) (8th ed., Aug. 2001).

Here, although the appellant alleges that "[t]he claims do not stand or fall together," (Appeal Br. at 8), he fails to satisfy the second requirement. His summaries of what claims 31, 131, 132, 136, 137, 207, 209, 219, 221, 231, 233, 238, 240, 259, 261, 278, 280, 409-439, 444, 449, 454, 459, 464, 465, 470, 471, 481, 482, 487, 488, 493, 494, 499, 503, 508, 513, 518, 519, 524, 529, 534, 535, 539, 544, 549, 553, 555, 560-562, 567, 568, 578, 583, 588, 592, 596, 601, 605, 610, 625, 630, 634, 639, 643, 644, 649, 654, 659, 660, 672, 668, 676, 677, 687, 692, 697, 702, 706, 710, 714, 718, 722, 726, 730, 734, 738, 742, 747, 752, 757, 762, and 767 cover, (Ex. 3), do not constitute an argument why the claims are separately patentable. Merely alleging that the examiner's rejection does "not establish why the express disclosure of the limitations in th[ese] claim[s] does not satisfy § 112-1," (*id.* at 1), moreover, does not challenge the rejection of the individual claims "with any reasonable specificity. . . ." *In re Nielsen*, 816 F.2d 1567, 1572, 2 USPQ2d 1525, 1528 (Fed. Cir. 1987). Therefore, claims 31, 131, 132, 136, 137, 207, 209, 219, 221, 231, 233, 238, 240, 259, 261, 278, 280, 409-439, 444, 449, 454, 459, 464, 465, 470, 471, 481, 482, 487, 488, 493, 494, 499, 503, 50, 508, 513, 518, 519, 524, 529, 534, 535, 539, 544, 549, 553, 555, 560-562, 567, 568, 578, 583, 588, 592, 596, 601, 605, 610, 625, 630, 634, 639, 643, 644, 649, 654, 659, 660, 672, 668, 676, 677, 687, 692, 697, 702, 706, 710, 714, 718, 722, 726, 730, 734, 738, 742, 747, 752, 757, 762, and 767 stand or fall with representative

claim 476. With this representation in mind, we address the claims in the following order:

- claim 21
- claims 31, 131, 132, 136, 137, 207, 209, 219, 221, 231, 233, 238, 240, 259, 261, 278, 280, 409-439, 444, 449, 454, 459, 464, 465, 470, 471, 476, 481, 482, 487, 488, 493, 494, 499, 503, 507, 508, 513, 518, 519, 524, 529, 534, 535, 539, 544, 549, 553, 555, 560-562, 567, 568, 573, 578, 583, 588, 592, 596, 601, 605, 610, 625, 630, 634, 639, 643, 644, 649, 654, 655, 659, 660, 668, 672, 676, 677, 687, 692, 697, 702, 706, 710, 714, 718, 722, 726, 730, 734, 738, 742, 747, 752, 757, 762, and 767
- claims 208, 220, 232, 239, 260, 279, 440-443, 445-448, 450-453, 455-458, 460-463, 466-469, 472-475, 477-480, 483-486, 489-492, 495-498, 500-502, 504-506, 509-512, 514-517, 520-523, 525-528, 530-533, 536-538, 540-543, 545-548, 550-552, 554, 556-559, 563-566, 569-572, 574-577, 579-582, 584-587, 589-591, 593-595, 597-600, 602-604, 606-609, 611-614, 626-629, 631-633, 635-638, 640-642, 645-648, 650-653, 656-658, 661-663, 669-671, 673-675, 678-681, 688-691, 693-696, 698-701, 703-705, 707-709, 711-713, 715-717, 719-721, 723-725, 727-729, 731-733, 735-737, 739-741, 743-746, 748-751, 753-756, 758-761, 763-766, and 768-771
- claims 441, 446, 456, 457, 461, 467, 474, 478, 490, 491, 496, 505, 510, 522, 526, 531, 536, 537, 546, 552, 557, 570, 571, 575, 580, 585, 590, 598, 603, 607, 612, 627, 632, 636, 647, 651, 662, 674, 689, 693, 694, 699, 713, 717, 721, 741, 745, 750, and 770.

1. Claim 21

The examiner asserts, "[w]hile there *may* be isolated mentions of 'rotation', 'translation' and 'compression', these individual items are not put all together all in a single embodiment as is being claimed." (Examiner's Answer at 44.) The appellant argues, "[c]laim 21 reads on supervisory computer 110R (Fig. 1A) which is disclosed as

having . . . the computer program 57 that performs the data compression, rotation, and translation is disclosed in great detail." (Appeal Br. at 32.) He adds, "[f]urther, the terms 'frame' and 'frames' are recited *verbatim* or near-*verbatim* in the body of the disclosure (e.g.; Spec. at 39. . . ." (Reply Br. at 69.)

"[C]ompliance with the 'written description' requirement of §112 is a question of fact. . . ." *Vas-Cath, Inc. v. Mahurkar*, 935 F.2d 1555, 1563, 19 USPQ2d 1111, 1116 (Fed. Cir. 1991) (citing *In re Gosteli*, 872 F.2d 1008, 1012, 10 USPQ2d 1614, 1618 (Fed. Cir. 1989); *Utter v. Hiraga*, 845 F.2d 993, 998, 6 USPQ2d 1709, 1714 (Fed. Cir. 1988)). "Although [the applicant] does not have to describe exactly the subject matter claimed, . . . the description must clearly allow persons of ordinary skill in the art to recognize that [he or she] invented what is claimed." *Id.*, 19 USPQ2d at 1116 (quoting *Gosteli*, 872 F.2d 1008, 1012, 10 USPQ2d 1614, 1618 (Fed. Cir. 1989)). "[T]he test for sufficiency of support . . . is whether the disclosure of the application relied upon 'reasonably conveys to the artisan that the inventor had possession at that time of the later claimed subject matter.'" *Ralston Purina Co. v. Far-Mar-Co., Inc.*, 772 F.2d 1570, 1575, 227 USPQ 177, 179 (Fed. Cir. 1985) (quoting *In re Kaslow*, 707 F.2d 1366, 1375, 217 USPQ 1089, 1096 (Fed. Cir. 1983)). "Application sufficiency under §112, first paragraph, must be judged as of the filing date [of the application]." *Vas-Cath*, 935

F.2d at 1566, 19 USPQ2d at 1119 (citing *United States Steel Corp. v. Phillips Petroleum Co.*, 865 F.2d 1247, 1251, 9 USPQ2d 1461, 1464 (Fed. Cir. 1989)).

Here, claim 21 recites in pertinent part the following limitations: "a display processor coupled to the accessing circuit and generating a plurality of frames of data compressed rotated and translated images by rotation and translation processing of the image accessed by the accessing circuit." In other words, the claim specifies that a processor rotates and translates an image to generate a plurality of frames of images that are compressed, rotated, and, translated.

Turning to the original specification, we find it discloses that a "[d]atabase memory 131B can store large amounts of high detail information. . . . This information can be stored . . . as video **frames** of information **representing** a mosaic of **images**." (Spec. at 39 (emphases added.)) Once stored, the "[f]rames can be selected by supervisory processor 131F, such as in real time under control of a dynamic allocation program using a look ahead for frames of information to be loaded into image memory 131D." (*Id.*) Upon selection of the frames, an "[i]mage processor 131E provides real time rotation, translation, spatial compression, anti-aliasing, and other image processing operations to achieve a dynamic image derived from the static image in image memory 131D. . . ." (*Id.* at 40-41 (emphases added).) We are not

persuaded that these disclosures fail to reasonably convey to the artisan that the appellant had possession of the claimed "display processor coupled to the accessing circuit and generating a plurality of frames of data compressed rotated and translated images by rotation and translation processing of the image accessed by the accessing circuit" as of the filing date of his application. Therefore, we reverse the written description rejection of claim 21.

2. Claims 31, 131, 132, 136, 137, 207, 209, 219, 221, 231, 233, 238, 240, 259, 261, 278, 280, 409-439, 444, 449, 454, 459, 464, 465, 470, 471, 476, 481, 482, 487, 488, 493, 494, 499, 503, 507, 508, 513, 518, 519, 524, 529, 534, 535, 539, 544, 549, 553, 555, 560-562, 567, 568, 573, 578, 583, 588, 592, 596, 601, 605, 610, 625, 630, 634, 639, 643, 644, 649, 654, 655, 659, 660, 668, 672 676, 677, 687, 692, 697, 702, 706, 710, 714, 718, 722, 726, 730, 734, 738, 742, 747, 752, 757, 762, and 767

Recognizing that the original specification "does mention a 'database memory' (130A)," (Examiner's Answer at 47), the examiner asserts, "[h]owever, it does not discuss the storing of a 'plurality of data compressed frames of topological altitude information, each of a plurality of the data compressed frames of topological altitude information comprising a plurality of data compressed blocks of topological altitude information, each of a plurality of the data compressed blocks of topological altitude information representing a data compressed block of topographical altitude information' as recited in . . . claim [476]." (*Id.*) The appellant argues that in his Experimental System embodiment, "the computer program controls the scanout of a frame of 64-pixel blocks of image information in image memory to refresh the CRT display monitor. The

frame of blocks of image information is scanned out of image memory on a block-by-block basis with 64-pixel blocks (e.g.; Spec. at 39, 195-196, and 197; respectively. . . .") (Reply Br. at 70.)

Representative claim 476 recites in pertinent part the following limitations:

"storing a database comprising a plurality of data compressed frames of topographical altitude information, each of a plurality of the data compressed frames of topographical altitude information comprising a plurality of data compressed blocks of topographical altitude information, each of a plurality of the data compressed blocks of topographical altitude information representing a data compressed block of topographical altitude information. . . ." In other words, the claim specifies that a database stores compressed frames of topographical, altitude information, and that each of the compressed frames comprises compressed blocks of topographical, altitude information.

Turning to the specification, the logic of the appellant's argument confounds us. Although the argument purports to refer to the operation of the "'Experimental System' embodiment," (Reply Br. at 70 n.31), which is shown in Figure 1H of the specification, (Spec. at 5), the passages of the specification cited by the appellant do not appear to describe this embodiment. To the contrary, page 39 describes "[a]n alternate configuration . . . with reference to Fig. 1J." (*Id.* at 38.) For their part, pages 195-97

describe "an experimental configuration with an image memory having 262,144-pixels arranged in a 512-by-512 pixel memory map. . . ." (*Id.* at 195.)

Besides referring to an "alternate configuration" instead of the "Experimental System embodiment", page 39 omits details of claim 476. Although the page discloses that "frames of information" "can be stored on a video disk," the frames are not stored in a compressed format. To the contrary, "[t]he frames can be stored having the highest spatial resolution that is required," (*id.* at 39), and later "compressed with image processor 131E to form an image . . . for the particular display scenario." (*Id.*) "For example, in a flight simulator application, frames can be stored for the highest zoom magnification and lowest aircraft altitude required. . . ." (*Id.*) It is unclear that frames for such an application represent topographical, altitude information. Furthermore, page 39 does not describe its frames of information as comprising compressed blocks of information.

Besides referring to an "experimental configuration" instead of the "Experimental System embodiment," pages 195-97 also omit details of claim 476. Instead of a database, the pages refer to the implementation of "an image memory." (*Id.* at 195.) The image memory is arranged in a memory map, (*id.*), which "contains a 64-by-64 array of blocks [of pixels] for a total of 4096 blocks." (*Id.* at 196.) Despite the mention

of blocks, the pages do not disclose that the blocks are compressed; that the blocks represent topographical, altitude information; or that the blocks constitute compressed frames of topographical, altitude information.

For these reasons, we find that the disclosure fails to reasonably convey to the artisan that the appellant had possession of the claimed "storing a database comprising a plurality of data compressed frames of topographical altitude information, each of a plurality of the data compressed frames of topographical altitude information comprising a plurality of data compressed blocks of topographical altitude information, each of a plurality of the data compressed blocks of topographical altitude information representing a data compressed block of topographical altitude information" as of the filing date of his application. Therefore, we affirm the written description rejection of claim 476 and of claims 31, 131, 132, 136, 137, 207, 209, 219, 221, 231, 233, 238, 240, 259, 261, 278, 280, 409-439, 444, 449, 454, 459, 464, 465, 470, 471, 481, 482, 487, 488, 493, 494, 499, 503, 507, 508, 513, 518, 519, 524, 529, 534, 535, 539, 544, 549, 553, 555, 560-562, 567, 568, 573, 578, 583, 588, 592, 596, 601, 605, 610, 625, 630, 634, 639, 643, 644, 649, 654, 655, 659, 660, 668, 672, 676, 677, 687, 692, 697, 702, 706, 710, 714, 718, 722, 726, 730, 734, 738, 742, 747, 752, 757, 762, and 767, which fall therewith.

3. Claims 208, 220, 232, 239, 260, 279, 440-443, 445-448, 450-453, 455-458, 460-463, 466-469, 472-475, 477-480, 483-486, 489-492, 495-498, 500-502, 504-506, 509-512, 514-517, 520-523, 525-528, 530-533, 536-538, 540-543, 545-548, 550-552, 554, 556-559, 563-566, 569-572, 574-577, 579-582, 584-587, 589-591, 593-595, 597-600, 602-604, 606-609, 611-614, 626-629, 631-633, 635-638, 640-642, 645-648, 650-653, 656-658, 661-663, 669-671, 673-675, 678-681, 688-691, 693-696, 698-701, 703-705, 707-709, 711-713, 715-717, 719-721, 723-725, 727-729, 731-733, 735-737, 739-741, 743-746, 748-751, 753-756, 758-761, 763-766, and 768-771

Observing that "241 of the pending claims,"² (Examiner's Answer at 16), "recite limitations for making one or more diverse types of products 'in response to' method or apparatus limitations of a parent claim," (*id.* at 17-18), the examiner asserts, "[t]here is simply no description in the specification, or any depiction in the drawings, of making these claimed 'products'." (*id.* at 18.) The appellant argues, "[t]he disclosure has written description of 'product' claim limitations in combination with other claim limitations." (Reply Br. at 164.)

Claims 208, 220, 232, 239, 260, 279, 440, 443, 445, 448, 450, 453, 455, 458, 460, 463, 466, 469, 472, 475, 477, 480, 483, 486, 489, 492, 495, 498, 500, 502, 504, 506, 509, 512, 514, 517, 520, 523, 525, 528, 530, 533, 538, 540, 543, 545, 548, 550, 554, 556, 559, 563, 566, 569, 572, 574, 577, 579, 582, 584, 587, 589, 591, 593, 595, 597, 600, 602, 604, 606, 609, 611, 614, 626, 629, 631, 633, 635, 638, 640, 642, 645, 648, 650, 653, 656, 658, 661, 663, 669, 671, 673, 675, 678, 681, 688, 691, 696, 698,

²The examiner should have enumerated the 241 claims.

701, 703, 704, 707, 708, 711, 712, 715, 716, 719, 720, 723, 724, 727, 728, 731, 732, 735, 736, 739, 740, 743, 744, 748, 749, 753, 754, 758, 759, 763, 765, 768, and 769 recite in pertinent part the making of a general "product," e.g., claim 208; a general "first product," e.g., claim 443; a general "second product," e.g., claim 443; or a general "third product," e.g., claim 443. Claims 442, 452, 468, 485, 501, 516, 532, 547, 565, 581, 586, 594, 608, 637, 652, 695, 725, 729, 733, 764, and 771 recite in pertinent part "making a display product" and the making of a general "second product." Claims 447, 462, 479, 497, 511, 527, 542, 558, 576, 599, 613, 628, 641, 657, 670, 680, 690, 700, 705, 709, 737, 755, and 760 recite in pertinent part "making a design product" and the making of a general "second product." Claim 451 recites in pertinent part "making a graphic product." Claim 473 recites in pertinent part "making a designed product." Claims 484 and 521 recite in pertinent part "making a data decompressed product." Claims 515 and 761 recite in pertinent part "making a processed product." Claims 541, 679, and 756 recite in pertinent part "making a manufactured product." Claims 551 and 751 recite in pertinent part "making a communication product." Claims 564, 646, and 746 recite in pertinent part "making a communicated product." Claim 766 recites in pertinent part "making an information product."

The examiner finds, "with one exception, variations of the term 'product' (e.g., 'products') [are] used in the specification only in a mathematical sense (such as for

multiplication or a sum-of-products)." (Examiner's Answer at 19.) The passage of the specification containing the "exception" discloses that "the final **product** of a graphic art system may be static photographs. . . ." (Spec. at 454 (emphasis added).)³ We find that the claimed making of a general "product," the claimed making of a general "first product," the claimed making of a general "second product," the claimed making of a general "third product," the claimed "making a display product," the claimed "making a design product," the claimed "making a graphic product," the claimed "making a designed product," the claimed "making a data decompressed product," the claimed "making a processed product," the claimed "making a manufactured product," the claimed "making a communication product," the claimed "making a communicated product," and the claimed "making an information product" each refer to the disclosed making of static photographs.

The disclosed making of static photographs, however, does not cure the lack of support for the independent claims from which the aforementioned claims depend. Therefore, we also affirm the written description rejection of dependent claims 208, 220, 232, 239, 260, 279, 440-443, 445-448, 450-453, 455-458, 460-463, 466-469, 472-475, 477-480, 483-486, 489-492, 495-498, 500-502, 504-506, 509-512, 514-517, 520-523, 525-528, 530-533, 536-538, 540-543, 545-548, 550-552, 554, 556-559, 563-566, 569-

³We are puzzled by the appellant's failure to cite the passage.

572, 574-577, 579-582, 584-587, 589-591, 593-595, 597-600, 602-604, 606-609, 611-614, 626-629, 631-633, 635-638, 640-642, 645-648, 650-653, 656-658, 661-663, 669-671, 673-675, 678-681, 688-691, 693-696, 698-701, 703-705, 707-709, 711-713, 715-717, 719-721, 723-725, 727-729, 731-733, 735-737, 739-741, 743-746, 748-751, 753-756, 758-761, 763-766, and 768-771.

4. Claims 441, 446, 456, 457, 461, 467, 474, 478, 490, 491, 496, 505, 510, 522, 526, 531, 536, 537, 546, 552, 557, 570, 571, 575, 580, 585, 590, 598, 603, 607, 612, 627, 632, 636, 647, 651, 662, 674, 689, 693, 694, 699, 713, 717, 721, 741, 745, 750, and 770

Observing that "pending claims," (Examiner's Answer at 16), "recite limitations for making one or more diverse types of products 'in response to' method or apparatus limitations of a parent claim," (*id.* at 17-18), the examiner finds, "[t]here is simply no description in the specification, or any depiction in the drawings, of making these claimed 'products'." (*id.* at 18.) The appellant argues, "[t]he disclosure has written description of 'product' claim limitations in combination with other claim limitations." (Reply Br. at 164.)

Exemplifying the appellant's "making a product" limitations, dependent claim 446 recites "[a] process as set forth in claim 444, further comprising the act of making a filter

product in response to the plurality of output data compressed blocks of image information." For its part, independent claim 444 recites the following limitations:

444. A process comprising the acts of:

storing a database comprising a plurality of data compressed mosaics of image information, each of a plurality of the data compressed mosaics of image information comprising a plurality of data compressed blocks of image information, each of a plurality of the data compressed blocks of image information representing a two dimensional 64-sample data compressed block of image information;

generating an accessed data compressed mosaic of image information in response to the plurality of data compressed mosaics of image information, the accessed data compressed mosaic of image information comprising a plurality of accessed data compressed blocks of image information, each of a plurality of the accessed data compressed blocks of image information representing an accessed two dimensional 64-sample data compressed block of image information; and

communicating a plurality of output data compressed blocks of image information to a remote location in response to the plurality of accessed data compressed blocks of image information, each of a plurality of the output data compressed blocks of image information representing an output two dimensional 64-sample data compressed block of image information.

In the dependent claim, the limitations "further comprising" and "in response to" evidence that the act of "making a filter product" is an additional act in the process of the independent claim. The product does not result from the process of the parent claim; it results from some additional act of "making."

Turning to the specification, the appellant asserts, "[t]he disclosure has more than 200 occurrences of 'filter' terminology." (Reply Br. at 168.) He fails to explain, however, the meaning of the claimed "filter product" or how it relates to the "filter terminology" of the specification. Although the specification discusses "[a] spatial filter arrangement," (Spec. at 162), for example, the arrangement is not described as being made "in response to the plurality of output data compressed blocks of image information."

Because the appellant has not shown that the specification describes either the claimed "filter product" or the claimed act of "making" the filter product in response to output data compressed blocks of image information, we find that the disclosure fails to reasonably convey to the artisan that the appellant had possession of the claimed "act of making a filter product in response to the plurality of output data compressed blocks of image information" as of the filing date of his application. Therefore, we affirm the written description rejection of claims 441, 446, 456, 457, 461, 467, 474, 478, 490, 491, 496, 505, 510, 522, 526, 531, 536, 537, 546, 552, 557, 570, 571, 575, 580, 585, 590, 598, 603, 607, 612, 627, 632, 636, 647, 651, 662, 674, 689, 693, 694, 699, 713, 717, 721, 741, 745, 750, and 770.

C. ENABLEMENT REJECTION

We address the enablement rejection of the claims in the following order:

- claims 21, 31, 131, 132, 136, 137, 207, 209, 219, 221, 231, 233, 238, 240, 259, 261, 278, 280, 409-439, 444, 449, 454, 459, 464, 465, 470, 471, 476, 481, 482, 487, 488, 493, 494, 499, 503, 507, 508, 513, 518, 519, 524, 529, 534, 535, 539, 544, 549, 553, 555, 560-562, 567, 568, 573, 578, 583, 588, 592, 596, 601, 605, 610, 625, 630, 634, 639, 643, 644, 649, 654, 655, 659, 660, 668, 672, 676, 677, 687, 692, 697, 702, 706, 710, 714, 718, 722, 726, 730, 734, 738, 742, 747, 752, 757, 762, and 767.
- claims 208, 220, 232, 239, 260, 279, 440, 442, 443, 445, 447, 448, 450-453, 455, 458, 460, 462, 463, 466, 468, 469, 472, 473, 475, 477, 479, 480, 483-486, 489, 492, 495, 497, 498, 500-502, 504, 506, 509, 511, 512, 514-517, 520, 521, 523, 525, 527, 528, 530, 532, 533, 538, 540-543, 545, 547, 548, 550, 551, 554, 556, 558, 559, 563-566, 569, 572, 574, 576, 577, 579, 581, 582, 584, 586, 587, 589, 591, 593-595, 597, 599, 600, 602, 604, 606, 608, 609, 611, 613, 614, 626, 628, 629, 631, 633, 635, 637, 638, 640-642, 645, 646, 648, 650, 652, 653, 656-658, 661, 663, 669-671, 673, 675, 678-681, 688, 690, 691, 695, 696, 698, 700, 701, 703-705, 707-709, 711, 712, 715, 716, 719, 720, 723-725, 727-729, 731-733, 735-737, 739, 740, 743, 744, 746, 748, 749, 751, 753-756, 758-761, 763-766, 768, 769, and 771
- claims 441, 446, 456, 457, 461, 467, 474, 478, 490, 491, 496, 505, 510, 522, 526, 531, 536, 537, 546, 552, 557, 570, 571, 575, 580, 585, 590, 598, 603, 607, 612, 627, 632, 636, 647, 651, 662, 674, 689, 693, 694, 699, 713, 717, 721, 741, 745, 750, and 770.

1. Claims 21, 31, 131, 132, 136, 137, 207, 209, 219, 221, 231, 233, 238, 240, 259, 261, 278, 280, 409-439, 444, 449, 454, 459, 464, 465, 470, 471, 476, 481, 482, 487, 488, 493, 494, 499, 503, 507, 508, 513, 518, 519, 524, 529, 534, 535, 539, 544, 549, 553, 555, 560-562, 567, 658, 573, 578, 583, 588, 592, 596, 601, 605, 610, 625, 630, 634, 639, 643, 644, 649, 654, 655, 659, 660, 668, 672, 676, 677, 687, 692, 697, 702, 706, 710, 714, 718, 722, 726, 730, 734, 738, 742, 747, 752, 757, 762, and 767

The examiner asserts, "[a] system is a combination of elements, where the combination is resultant from the interconnection of various components to perform a function. The interconnections and interactions of the claimed components to perform the claimed functions in combination is lacking from Appellant's specification."

(Examiner's Answer at 26.) He adds, "complex subject matter merits a thorough and detailed disclosure of how the claimed elements are, in fact, connected to each other, in order to perform the claimed interrelated processes being claimed." (*Id.* at 56-57.)

The appellant argues, "[t]he instant disclosure . . . includes significant details for the actually reduced-to-practice 'Experimental System' -- e.g.; detailed schematic diagrams (Figs. 6B-6AH), integrated circuit component placement on the circuit boards (Spec. at 522-543), actual wiring between the integrated circuit components (Figs. 6B-6AH), details of cable wires between system components (Spec. at 510-521), and the detailed computer program source code listings (Spec. at 544-574)." (Reply Br. at 253.)

"[T]he PTO bears an initial burden of setting forth a reasonable explanation as to why it believes that the scope of protection provided by that claim is not adequately enabled by the description of the invention provided in the specification of the application. . . ." *In re Wright*, 999 F.2d 1557, 1561-62, 27 USPQ2d 1510, 1513 (Fed. Cir. 1993) (citing *In re Marzocchi*, 439 F.2d 220, 223-24, 169 USPQ 367, 369-70 (CCPA 1971)). More specifically, "[t]o be enabling under §112, a patent must contain a description that enables one skilled in the art to make and use the claimed invention." *Atlas Powder Co. v. E. I. Du Pont de Nemours & Co.*, 750 F.2d 1569, 1576, 224 USPQ 409, 413 (Fed. Cir. 1984) (citing *Raytheon Co. v. Roper Corp.*, 724 F.2d 951, 960, 220 USPQ 592, 599 (Fed. Cir. 1983)). "That some experimentation is necessary does not preclude enablement; the amount of experimentation, however, must not be unduly extensive." *Id.*, 224 USPQ at 413.

Here, the examiner offers a "full[] explanation of . . . undue experimentation. . . ." (Examiner's Answer at 25.) The explanation, however, is not directed to the specific claim language. Claim 21, for example, recites in pertinent part "a memory **coupled** to the input circuit and storing an image in response to the input image information generated by the input circuit; an accessing circuit **coupled** to the memory and accessing the image from the memory; and a display processor **coupled** to the accessing circuit and generating a plurality of frames of data compressed rotated and

translated images by rotation and translation processing of the image accessed by the accessing circuit." (Emphases added.) We are uncertain which of the claimed couplings the examiner believes lack enablement.

The examiner's explanation includes eight factors in determining whether undue experimentation is present. (*Id.* at 54-62.) We address two of the factors. Regarding the "state of the prior art," the examiner asserts, "[t]he state of the prior art, as exemplified by the art cited in the art rejection herein, was fully considered in making the enablement rejection." (*Id.* at 57.) Marsh, however, omits a thorough and detailed disclosure of how the components of its image processor are connected. Instead, the reference merely shows signal lines interconnecting the Translation Stage, the Rotation Stage, and the other components. Figs. 1 and 3-7. We are uncertain why the examiner would require more detail than that shown in Marsh.

Regarding the "level of ordinary skill in the art," the examiner admits, "[i]mage processing is a highly skilled art." (Examiner's Answer at 58.) He then asserts, "[g]iven that the connections and interrelations of exemplary claims 21 and 476 are simply not disclosed at all," (*id.* at 58-59), "the practitioner would be attempting to make and use the claimed invention with the equivalent of no disclosure at all. . . ." (*Id.* at 59.) Such an assertion, however, overlooks the admittedly high level of skill in the art.

The examiner has not persuaded us that the specification would not enable one skilled in the art to interconnect the components of the claimed invention without undue experimentation. Therefore, we reverse the enablement rejection of claims 21, 31, 131, 132, 136, 137, 207, 209, 219, 221, 231, 233, 238, 240, 259, 261, 278, 280, 409-439, 444, 449, 454, 459, 464, 465, 470, 471, 476, 481, 482, 487, 488, 493, 494, 499, 503, 507, 508, 513, 518, 519, 524, 529, 534, 535, 539, 544, 549, 553, 555, 560-562, 567, 658, 573, 578, 583, 588, 592, 596, 601, 605, 610, 625, 630, 634, 639, 643, 644, 649, 654, 655, 659, 660, 668, 672, 676, 677, 687, 692, 697, 702, 706, 710, 714, 718, 722, 726, 730, 734, 738, 742, 747, 752, 757, 762, and 767.

2. Claims 208, 220, 232, 239, 260, 279, 440, 442, 443, 445, 447, 448, 450-453, 455, 458, 460, 462, 463, 466, 468, 469, 472, 473, 475, 477, 479, 480, 483-486, 489, 492, 495, 497, 498, 500-502, 504, 506, 509, 511, 512, 514-517, 520, 521, 523, 525, 527, 528, 530, 532, 533, 538, 540-543, 545, 547, 548, 550, 551, 554, 556, 558, 559, 563-566, 569, 572, 574, 576, 577, 579, 581, 582, 584, 586, 587, 589, 591, 593-595, 597, 599, 600, 602, 604, 606, 608, 609, 611, 613, 614, 626, 628, 629, 631, 633, 635, 637, 638, 640-642, 645, 646, 648, 650, 652, 653, 656-658, 661, 663, 669-671, 673, 675, 678-681, 688, 690, 691, 695, 696, 698, 700, 701, 703-705, 707-709, 711, 712, 715, 716, 719, 720, 723-725, 727-729, 731-733, 735-737, 739, 740, 743, 744, 746, 748, 749, 751, 753-756, 758-761, 763-766, 768, 769, and 771

The examiner asserts, "[t]he specification provides no guidance as to how these products are made or what these products are intended to be. Without any guidance from the originally filed specification, one of ordinary skill in the art would be burdened with undue experimentation or delay in trying to make and use the claimed invention."

(Examiner's Answer at 30.) The appellant argues, "[t]he disclosed computer programs provide 'working examples' of products. . . ." (Reply Br. at 110.)

In addressing the written description rejection, we found that claims 208, 220, 232, 239, 260, 279, 440, 442, 443, 445, 447, 448, 450-453, 455, 458, 460, 462, 463, 466, 468, 469, 472, 473, 475, 477, 479, 480, 483-486, 489, 492, 495, 497, 498, 500-502, 504, 506, 509, 511, 512, 514-517, 520, 521, 523, 525, 527, 528, 530, 532, 533, 538, 540-543, 545, 547, 548, 550, 551, 554, 556, 558, 559, 563-566, 569, 572, 574, 576, 577, 579, 581, 582, 584, 586, 587, 589, 591, 593-595, 597, 599, 600, 602, 604, 606, 608, 609, 611, 613, 614, 626, 628, 629, 631, 633, 635, 637, 638, 640-642, 645, 646, 648, 650, 652, 653, 656-658, 661, 663, 669-671, 673, 675, 678-681, 688, 690, 691, 695, 696, 698, 700, 701, 703-705, 707-709, 711, 712, 715, 716, 719, 720, 723-725, 727-729, 731-733, 735-737, 739, 740, 743, 744, 746, 748, 749, 751, 753-756, 758-761, 763-766, 768, 769, and 771 each refer to the disclosed making of static photographs. We are not persuaded that the specification would not enable one skilled in the art to make static photographs without undue experimentation. Therefore, we reverse the enablement rejection of claims 208, 220, 232, 239, 260, 279, 440, 442, 443, 445, 447, 448, 450-453, 455, 458, 460, 462, 463, 466, 468, 469, 472, 473, 475, 477, 479, 480, 483-486, 489, 492, 495, 497, 498, 500-502, 504, 506, 509, 511, 512, 514-517, 520, 521, 523, 525, 527, 528, 530, 532, 533, 538, 540-543, 545, 547, 548,

550, 551, 554, 556, 558, 559, 563-566, 569, 572, 574, 576, 577, 579, 581, 582, 584, 586, 587, 589, 591, 593-595, 597, 599, 600, 602, 604, 606, 608, 609, 611, 613, 614, 626, 628, 629, 631, 633, 635, 637, 638, 640-642, 645, 646, 648, 650, 652, 653, 656-658, 661, 663, 669-671, 673, 675, 678-681, 688, 690, 691, 695, 696, 698, 700, 701, 703-705, 707-709, 711, 712, 715, 716, 719, 720, 723-725, 727-729, 731-733, 735-737, 739, 740, 743, 744, 746, 748, 749, 751, 753-756, 758-761, 763-766, 768, 769, and 771.

3. Claims 441, 446, 456, 457, 461, 467, 474, 478, 490, 491, 496, 505, 510, 522, 526, 531, 536, 537, 546, 552, 557, 570, 571, 575, 580, 585, 590, 598, 603, 607, 612, 627, 632, 636, 647, 651, 662, 674, 689, 693, 694, 699, 713, 717, 721, 741, 745, 750, and 770

The examiner asserts, "[t]he specification provides no guidance as to how these products are made or what these products are intended to be. Without any guidance from the originally filed specification, one of ordinary skill in the art would be burdened with undue experimentation or delay in trying to make and use the claimed invention." (Examiner's Answer at 30.) The appellant argues, "[t]he disclosed computer programs provide 'working examples' of products. . . ." (Reply Br. at 110.)

In addressing the written description rejection, *supra*, we found no showing the specification describes either the meaning of the claimed products or the act of making

the products. Without knowing the identity of the claimed products, we are not persuaded that the specification would enable one skilled in the art to make and use the claimed products without undue experimentation. Therefore, we affirm the enablement rejection of claims 441, 446, 456, 457, 461, 467, 474, 478, 490, 491, 496, 505, 510, 522, 526, 531, 536, 537, 546, 552, 557, 570, 571, 575, 580, 585, 590, 598, 603, 607, 612, 627, 632, 636, 647, 651, 662, 674, 689, 693, 694, 699, 713, 717, 721, 741, 745, 750, and 770.

D. Obviousness Rejection over Marsh

Here, claim 31 is the only claim rejected over Marsh (sans Widergren) that the appellant specifically addresses. (Reply Br. at 291-93.) His summaries of what claims 578-614, 625-638, and 672-675 cover, (Ex. 3), do not constitute an argument why the claims are separately patentable. Merely alleging that the examiner's rejection does not establish the "obviousness of this combination of limitations, nor the obviousness of the recited cooperation between limitations in th[ese] claim[s]," (*id.* at 1), moreover, does not challenge the rejection of the individual claims with any reasonable specificity. Therefore, claims 578-614, 625-638, and 672-675 stand or fall with representative claim 31. With this representation in mind, we address the following points of contention:

- analogousness of Marsh
- image memory

- image loading
- looking ahead
- image processor.

1. Analogousness of Marsh

The examiner finds, "Marsh teaches an image processing system. . . ."

(Examiner's Answer at 31.) The appellant argues, "Marsh is nonanalogous with the instant claimed invention — Marsh shows a graphics (polygon) flight simulator system while the instant claimed invention is directed to a novel system having a relational database, topographical altitude, topographical occulting, topographical shadowing, and others." (Reply Br. at 277.)

"Whether a reference in the prior art is 'analogous' is a fact question." *In re Clay*, 966 F.2d 656, 658, 23 USPQ2d 1058, 1060 (Fed. Cir. 1992) (citing *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1568 n.9, 1 USPQ2d 1593, 1597 n.9 (Fed. Cir. 1987)). Two criteria have evolved for answering the question: "(1) whether the art is from the same field of endeavor, regardless of the problem addressed, and (2) if the reference is not within the field of the inventor's endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved." *Id.* at 658-59, 23 USPQ2d at 1060 (citing *In re Deminski*, 796 F.2d 436, 442, 230 USPQ 313, 315 (Fed. Cir. 1986); *In re Wood*, 599 F.2d 1032, 1036, 202 USPQ 171, 174 (CCPA 1979)).

Here, regarding the first criterion, the appellant states that "[t]he field of the present invention is display and machine vision systems and, in particular, image processing systems." (Spec. at 3.) Similarly, Marsh "relates to an imaging system for displaying objects. . . ." Col. 1, ll. 7-8.

The appellant also discloses that his invention includes a flight simulation application. (Spec. at 466.) Similarly, Marsh's invention concerns "a flight simulation system. . . ." Col. 2, l. 22. Because the inventions of the appellant and the reference are both from the field of display systems, imaging systems, or flight simulators, we find that Marsh is analogous art.

2. Image Memory

The examiner finds, "Marsh teaches . . . an image memory (304, 306, in Figure 3, makes up part of element 46 in Figures 1 and 3; additionally, each of the stages 60-65 also includes memories for storing the image data that they are operating on; any of these memories can be read on the extremely broad recitations in the claims) for storing the image (where the image is accessed from part of the data base 48). . . ." (Examiner's Answer at 31.) The appellant argues, "Marsh expressly states that element 46 is an 'interface controller' with a RAM buffer (Marsh at cols. 2:33

and 3:32-41). Marsh does not state that the RAM buffer is an image memory." (Reply Br. at 291.)

In addressing the point of contention, the Board conducts a two-step analysis. First, we construe the representative claim at issue to determine its scope. Second, we determine whether the construed claim would have been obvious.

a. Claim Construction

"Analysis begins with a key legal question — *what is the invention claimed?*" *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1567, 1 USPQ2d 1593, 1597 (Fed. Cir. 1987). In answering the question, "the Board must give claims their broadest reasonable construction. . . ." *In re Hyatt*, 211 F.3d 1367, 1372, 54 USPQ2d 1664, 1668 (Fed. Cir. 2000).

Here, claim 31 recites in pertinent part the following limitations: "an image memory. . . ." Giving the claim its broadest, reasonable construction, the limitations require a memory for storing an image.

b. Obviousness Determination

Having determined what subject matter is being claimed, the next inquiry is whether the subject matter would have been obvious. The question of obviousness is "based on underlying factual determinations including . . . what th[e] prior art teaches explicitly and inherently. . . ." *In re Zurko*, 258 F.3d 1379, 1383, 59 USPQ2d 1693, 1696 (Fed. Cir. 2001) (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17-18, 148 USPQ 459, 467 (1966); *In re Dembiczak*, 175 F.3d 994, 998, 50 USPQ 1614, 1616 (Fed. Cir. 1999); *In re Napier*, 55 F.3d 610, 613, 34 USPQ2d 1782, 1784 (Fed. Cir. 1995)). Anticipation "is not an 'ipsissimis verbis' test," *In re Bond*, 910 F.2d 831, 832, 15 USPQ2d 1566, 1567 (Fed. Cir. 1990) (citing *Akzo N.V. v. United States Int'l Trade Comm'n*, 808 F.2d 1471, 1479 & n.11, 1 USPQ2d 1241, 1245 & n.11 (Fed. Cir. 1986)), and neither is obviousness. Rather, "[a] *prima facie* case of obviousness is established when the teachings from the prior art itself would . . . have suggested the claimed subject matter to a person of ordinary skill in the art." *In re Bell*, 991 F.2d 781, 783, 26 USPQ2d 1529, 1531 (Fed. Cir. 1993) (quoting *In re Rinehart*, 531 F.2d 1048, 1051, 189 USPQ 143, 147 (CCPA 1976)).

Here, Marsh's "FIG. 1 shows a flight simulation system 10 with visual capabilities provided by a digital visual system 12." Col. 2, ll. 22-24. The "[v]isual system 12 is formed by image processor 42 and display generator 44. General purpose

computer 40 (i.e., a PDP 11/35 from Digital Equipment Corporation) coordinates flight data and terrain data through interface controller 46 into translation stage 60 via a data buffer." *Id.* at ll. 29-34.

For its part, the "GP computer 40 . . . receives terrain data (both natural formations and cultural structures) from data base 48 such as runaways, towers, hangers, roads, rivers, fields, moving objects, etc." *Id.* at ll. 37-41. More specifically, the "GP computer 40 has an in-core, buffer memory which accumulates blocks of image data required to form each display frame." Col. 3, ll. 26-28. "The image data accumulating in the in-core buffer is periodically transferred as a data block to hardware RAM buffer 304 in interface controller 46." *Id.* at ll. 32-34. Because Marsh stores image data in the RAM (i.e., the random access **memory**) buffer 304 of the interface controller, we find that the RAM buffer 304 constitutes a memory for storing an image.

3. Image Loading

The examiner finds, "each memory or storage device much inherently include writing and accessing circuits that control the storage and retrieval of data in the memory or storage device so that these devices can be useful in storing the data needed by the various processing operations. Therefore, this element of the claimed invention is inherently taught by Marsh." (Examiner's Answer at 32.) The appellant

argues, "the Examiner has refused to perform the required inherency analysis. . . ."
(Reply Br. at 293.)

a. Claim Construction

Claim 31 recites in pertinent part the following limitations: "an image memory loading circuit coupled to the database memory and coupled to the image memory and loading the portion of the database image stored by the database memory into the image memory. . . ." Giving the claim its broadest, reasonable construction, the limitations further require a circuit for transferring part of an image stored in a database into the image memory.

b. Obviousness Determination

As mentioned regarding the prior point of contention, Marsh's GP computer 40 loads image data from the data base 48 into an internal buffer. As also mentioned regarding the prior point of contention, the image data in the buffer are periodically transferred to the image memory 304. The reference calls the latter transfer a "handshake data transfer to RAM 304." Col. 3, ll. 39-40. Because Marsh's GP computer loads image data from the data base, and the GP subsequently transfers the image data to the image memory, we find that the GP constitutes a circuit for transferring part of an image stored in a database into the image memory.

4. Looking Ahead

The examiner finds, "Marsh teaches . . . a lookahead circuit that generates lookahead information (column 3, lines 36-38; while current data is processed, next data is downloaded and prepared for processing). . . ." (Examiner's Answer at 31.) The appellant argues, "Marsh at col. 3:36-38 does not even mention 'a lookahead circuit that generates lookahead information'. . . ." (Reply Br. at 291-92.)

a. Claim Construction

Claim 31 recites in pertinent part the following limitations: "a lookahead circuit generating lookahead information. . . ." Giving the claim its broadest, reasonable construction, the limitations require a circuit that looks ahead to generate information.

b. Obviousness Determination

As mentioned regarding the second point of contention, Marsh periodically transfers image data as a data block to the image RAM 304 of the interface controller 46. Once stored therein, the interface "[c]ontroller 46 processes the data words sequentially to image processor 42. . . ." Col. 3, ll. 34-36. While the interface controller is "processing" the data words to the image processor, the "GP computer 40 simultaneously assembles the next data block in the in-core buffer for the next data handshake with RAM 304." *Id.* at ll. 36-38. Because the GP computer generates a

next data block for a future transfer while the image controller currently processes current data, we find that the GP computer is looking ahead to a future transfer, viz., the next transfer. We further find that the next data block constitutes lookahead information.

5. Image Processor

The examiner finds, "Marsh teaches . . . a processor (display circuit) for processing the image stored in the memory to generate display data (comprising elements 60, 60C, 62, 63, 64, 65 and 72 in Figure 1, and detailed more specifically in subsequent figures; these circuits manipulate the image data and generate display data from the original image data). . . ." (Examiner's Answer at 31-32.) The appellant argues, "the Examiner disregards the claim limitations 'coupled to the image memory and coupled to the lookahead circuit', 'by processing the portion of the database image stored in the image memory', and 'in response to the lookahead information'." (Reply Br. at 293.)

a. Claim Construction

Claim 31 recites in pertinent part the following limitations: "an image processor coupled to the image memory and coupled to the lookahead circuit, the image processor generating a processed image by processing the portion of the database

image stored in the image memory in response to the lookahead information generated by the lookahead circuit." Giving the claim its broadest, reasonable construction, the limitations further require an image processor processing the image stored in the image memory in response to the looking ahead.

b. Obviousness Determination

As mentioned regarding the second point of contention, Marsh periodically "processes," i.e., transfers, image data from the image RAM 304 to the image processor 42. "The image data . . . include[]: [i]nitial position data (V_o), . . . [s]hape data (delta data) defining the relative position of other points, . . . with respect to the landmark points of each V_o ." Abs., ll. 11-21. The image processor processes the image data it receives by "translat[ing] initial position data into the aircraft coordinate system; then rotat[ing], clip[ping], and project[ing] each three-dimensional position vector to form two-dimensional display vectors." *Id.* at ll. 26-29. Because the image data were assembled into a next data block by the GP computer looking ahead to a future transfer, we find that the processing of image data is performed in response to the looking ahead. Therefore, we affirm the obviousness rejection of claim 31 and of claims 578-614, 625-638, and 672-675, which fall therewith.

E. Obviousness Rejection over Marsh and Widergren

Although the appellant summarizes what claims 131, 132, 137, 207-209, 219-221, 231-233, 239, 240, 259-261, 278-280, 410-416, 418, 420, 421, 423-425, 427, 430, 431, 433-458, 460-577, 639-663, 668-671, 676-681, and 687-771 cover, (Ex. 3), this does not constitute an argument why the claims are separately patentable. Merely alleging that the examiner's rejection does not establish the "obviousness of this combination of limitations, nor the obviousness of the recited cooperation between limitations in th[ese] claim[s]," (*id.* at 1), moreover, does not challenge the rejection of the individual claims with any reasonable specificity. Therefore, claims 131, 132, 137, 207-209, 219-221, 231-233, 239, 240, 259-261, 278-280, 410-416, 418, 420, 421, 423-425, 427, 430, 431, 433-458, 460-577, 639-663, 668-671, 676-681, and 687-771 stand or fall with representative claim 21. With this representation in mind, we address the following points of contention:

- analogousness of Widergren
- rotating and translating
- relational database
- topological altitude information
- topographical shadowing
- mosaics
- multilevel memory
- multiplexing
- communicating to remote location.

1. Analogousness of Widergren

The examiner finds, "Widergren et al. teaches the use of data compression to compress a sequence of images (see the abstract) and further teaches the use of a decompression circuit to decompress this data (34-38 in Figure 1)." (Examiner's Answer at 36.) The appellant argues, "Widergren is non-analogous with the instant claimed invention -- Widergren shows a data compression television system while the instant claimed invention is directed to a novel system having a relational database, topographical altitude, topographical occulting, topographical shadowing, and others." (Reply Br. at 277.)

As mentioned regarding the obviousness rejection over Marsh alone, the appellant's field of invention includes display systems and, in particular, image processing systems. Similarly, Widergren "provide[s] a digital video compression system," col. 3, ll. 40-41, for "digitalized television picture signals. . . ." Col. 1, ll. 9-10. The reference's digital video compression is a form of image processing. Furthermore Widergren's signals are eventually displayed on a television. Because the inventions of the appellant and the reference are both from the field of imaging system or display systems, we find that Widergren is analogous art.

2. Rotating and Translating

The examiner finds, "Marsh further includes . . . performing rotation (62 in Figure 1) and translation (60 in Figure 1). . . ." (Examiner's Answer at 34.) Regarding claim 21, the appellant argues, "Marsh uses a graphics-type polygon system that performs rotation and translation differently than claimed for the present image processing system" (Reply Br. at 301.)

a. Claim Construction

Claim 21 recites in pertinent part the following limitations: "generating a plurality of frames of data compressed rotated and translated images by rotation and translation processing of the image accessed by the accessing circuit." Giving the claim its broadest, reasonable construction, the limitations require rotating and translating compressed images.

b. Obviousness Determination

As mentioned regarding the obviousness rejection over Marsh alone, the reference's image processor rotates and translates the image data transferred from the database. Abs., ll. 11-29. Because Marsh's "data base is compressed [such that] each object face is stored in the data base as a single initial point plus a series of addresses and a scale factor, rather than a plurality of separate vertices," col. 36, ll. 60-63,

moreover, the image data stored therein are compressed. Accordingly, we find that Marsh rotates and translates compressed images.

Furthermore, we agree with the examiner that "Widergren et al. teaches the use of data compression to compress a sequence of images (see the abstract)," (Examiner's Answer at 36), and note that the reference further teaches that compression is used "to reduce . . . bandwidth. . . ." Col. 1, l. 51. Persuaded that teachings from Marsh and Widergren would have suggested the claimed subject matter to a person of ordinary skill in the art, we affirm the obviousness rejection of claim 21 and of claims 131, 132, 137, 207-209, 219-221, 231-233, 238-240, 259-261, 278-280, 410-416, 418, 420, 421, 423-425, 427, 430, 431, 433-458, 460-577, 639-663, 668-671, 676-681, and 687-771, which fall therewith.

3. Relational Database

The examiner finds, "the information stored in the database of Marsh is relational graphic image data representing topographical information (terrain data; column 2, lines 38-41). . . ." (Examiner's Answer at 32.) Regarding claims 409, 426, 428, 429, and 432, the appellant argues, "Marsh at col. 2: 38-41 does not even mention anything relational, not a relational database nor relational graphic image data and certainly not the specific claim limitations. . . ." (Reply Br. at 294.)

a. Claim Construction

"[L]imitations are not to be read into the claims from the specification." *In re Van Geuns*, 988 F.2d 1181, 1184, 26 USPQ2d 1057, 1059 (Fed. Cir. 1993) (citing *In re Zletz*, 893 F.2d 319, 321, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989)). Here, the appellant argues the relational database limitations of claims 409, 426, 428, 429, and 432 as a group. (Reply Br. at 294-95.) We select the limitations of claim 429 as representative of the group. Claim 429 recites in pertinent part the following limitations: "a relational database . . . comprising a plurality of data compressed blocks of image information. . . ." Contrary to the appellant's argument, the limitations do not require relational graphic image data. Giving the claim its broadest, reasonable construction, the limitations require a relational database.

b. Obviousness Determination

As mentioned regarding the obviousness rejection over Marsh alone, the reference's database stores terrain data representing both natural formations and cultural structures such as runaways, towers, hangers, roads, rivers, fields, and moving objects. Col. 2, ll. 38-41. "FIG. 2a is a pictorial representation of an aircraft and several terrain features illustrating the image vectors. . . ." Col. 1, ll. 61-62. The Figure shows that the runway 230 and hanger 240 are spatially related to each other and to the aircraft 14. Because the terrain data stored in the database are spatially related, we

find that the database is a relational database. Therefore, we affirm the obviousness rejection of claims 426 and 428.

4. Topological Altitude Information

The examiner finds, "the information stored in the database of Marsh is . . . topographical altitude information (as discussed at column 2, lines 54-58 and shown in Figure 2, the database includes information defining the three-dimensional position of the vertices of topographical objects; the vertical position information for such topographical objects is topographical altitude information)" (Examiner's Answer at 32.) Regarding claims 419, 429, and 459, the appellant argues, "Marsh at col. 2:38-41 does not even mention topographical or altitude and certainly not the specific claim limitations. . . ." (Reply Br. at 296.)

a. Claim Construction

The appellant argues the topographical altitude information limitations of claims 419, 429, and 459 as a group. (Reply Br. at 295-96.) We select the limitations of the middle claim as representative of the group. Claim 429 further recites in pertinent part the following limitations: "storing a relational database comprising topographical altitude information. . . ." Giving the claim its broadest, reasonable

construction, the limitations further require that the database store information relating to topographical altitude.

b. Obviousness Determination

"The terrain data [stored in Marsh's database] . . . includes . . . three dimensional object items formed by polygon faces having shapes orientations and dimensions. . . ."
Abs., ll. 1-3. An example of a three-dimensional object is the hanger shown in Figure 2A as element 240 and in Figure 11 as element 1110. "[T]he three edges of hanger 1110 are positioned parallel to the three axis [sic] of the object coordinate system," col. 35, ll. 52-54, viz., an x-axis, a y-axis, and a z-axis. Because the z-dimension of the objects represented by the terrain data represents an altitude and a topography, we find that the reference's database stores information relating to topographical altitude.

5. Topographical Shadowing

The examiner finds that in Marsh "the processed, displayed images represent topographically occulted/shadowed image data (column 13, lines 39-63; topographical or terrain image information that is blocked from view (i.e., occulted or shadowed). . . ."
(Examiner's Answer at 32.) Further regarding claims 419, 429, and 459, the appellant argues, "Marsh mentions 'occluding' at col. 13:55-57, but this is '[t]he sign bit . . . is

employed for back side elimination, a simple occulting technique.' This is significantly different from the claimed 'topographically occulted', 'topographically shadowed', and 'topographical altitude'." (Reply Br. at 298.)

a. Claim Construction

The appellant argues the topographical altitude information limitations of claims 419, 429, and 459 as a group. (Reply Br. at 297-98.) We select the limitations of the middle claim as representative of the group. Claim 429 further recites in pertinent part the following limitations: "displaying a topographically shadowed image in response to the accessed topographical altitude information. . . ." Giving the claim its broadest, reasonable construction, the limitations further require displaying a topographically shadowed image.

b. Obviousness Determination

The appellant admits that "Marsh mentions 'occulting' at col. 13:55-57. . . ." (Reply Br. at 298.) For its part, the reference discloses that its "rotation circuitry . . . provides the multiplication for the dot product visibility test for the faces which form three dimensional structures such as buildings: $V_t \text{ dot } V_n = M \cos P$ where: V_t is the translated vector extending from aircraft 14 to the first vertex of the face being tested; and V_n is the vector normal to the face being tested." Col. 13, ll. 39-49. "When $\cos P$ is

negative, . . . the face is visible because the face is on the front or exposed side of the building. When $\cos P$ is positive, . . . the face is invisible because the face is on the back side of the building. The sign bit of the dot product is employed for back side elimination, a simple occulting technique." *Id.* at ll. 51-57. We agree with the examiner's finding that the back side elimination constitutes topographic shadowing. By displays a three-dimensional object with such shadowing, moreover, we find that the reference is displaying a topographically shadowed image. Therefore, we affirm the obviousness rejection of claims 419, 429, and 459.

6. Mosaics

The examiner finds, "Marsh further includes . . . that the processed data is mosaic image data (the various objects obtained from the database 48 are processed and combined or merged to form a 'mosaic' image that is made up of a plurality of individual elements or 'mosaics'). . . ." (Examiner's Answer at 34-35.) Regarding claims 432 and 459, the appellant argues, "Marsh does not teach mosaics as claimed. . . ." (Reply Br. at 302.)

a. Claim Construction

The appellant argues the mosaic limitations of claims 432 and 459 as a group. (Reply Br. at 302-03.) We select the limitations of the latter claim as representative of

the group. Claim 459 recites in pertinent part the following limitations: "a database comprising a plurality of data compressed mosaics of topographical altitude information. . . ." Giving the claim its broadest, reasonable construction, the limitations further require storing mosaics.

b. Obviousness Determination

Three-dimensional objects stored in Marsh's database, abs., ll. 1-3, are combined to form a "scene." Col. 1, l. 18. For example, the scene shown in Figure 2A includes a hanger and a flagpole. Furthermore, the reference may aggregate runaways, towers, hangers, roads, rivers, fields, and moving objects, col. 2, ll. 39-41, to form a different scene. Because the objects stored in the database are aggregated to form scenes, we find that the database stores mosaics. Therefore, we affirm the obviousness rejection of claim 432.

7. Multilevel Memory

Noting that "Marsh teaches that plural bit data 'word' are stored in the memory (see column 3, lines 45-50)," the examiner asserts, "the memory devices of Marsh must inherently include a multilevel capacity in order to properly store and retrieve such multibit words without errors in separating one word from another." (Examiner's Answer at 35.) Regarding claim 422, the appellant argues, "Marsh appears to use digital

memories having the conventional single digital bit per cell, Marsh does not teach a multibit per cell memory as claimed. . . ." (Reply Br. at 304.)

a. Claim Construction

Claim 422 recites in pertinent part the following limitations: "an integrated circuit multilevel memory having a plurality of multilevel memory cells, each of the plurality of multilevel memory cells storing at least two digital bits of information in a plurality of levels. . . ." Giving the claim its broadest, reasonable construction, the limitations require memory cells storing at least two digital bits of information in levels.

b. Obviousness Determination

The passage of Marsh cited by the examiner discloses that "[p]rior to each training flight, the content of data base 48 is loaded into computer 40 core-memory. Image data from data base 4[8] includes sixteen control words (0000-1111) having bit formats as described hereinafter, initialization data V_o , delta data, etc." Col. 3, ll. 45-49. The database and the core-memory represent different levels of memory. Because the control words stored therein comprise multiple bits of information, moreover, we find that the cells of the database and the core-memory store at least two digital bits of information in levels. Therefore, we affirm the obviousness rejection of claim 422.

8. Multiplexing

The examiner finds, "Marsh further includes . . . the use of a plurality of multiplexors to select appropriate image data for output (for example MUX 416X or COL MUX 420X in Figure 4). . . ." (Examiner's Answer at 34-35.) Regarding claims 136, 137, and 238, the appellant argues, "Marsh does not teach the specific multiplexer limitations recited in the claims. . . ." (Reply Br. at 301.)

a. Claim Construction

The appellant argues the multiplexing limitations of claims 136, 137, and 238 as a group. (Reply Br. at 301-302.) We select the limitations of the latter claim as representative of the group. Claim 238 recites in pertinent part the following limitations: "generating multiplexed channels of frames of data compressed digital output image information by multiplexing the accessed frames of data compressed digital output image information. . . ." Giving the claim its broadest, reasonable construction, the limitations require multiplexing data channels.

b. Obviousness Determination

Marsh's "FIG. 4 shows rotation stage 62 of image processor 42. . . ." Col. 12, l. 52. The rotation stage is shown to include at least two multiplexors. First, "MUX 416x may be a 16 bit dual 4-1 multiplexer (three 74S153's) for providing four bits of output

plus carry over bit." Col. 14, ll. 11-13. As seen in the Figure, the MUX 416x multiplexes four data channels into a single output.

Second, "Row Multiplexer 424 may be a 20 bit 4 to 1 multiplexer (ten 74157's connected in parallel) which sequentially select the first row elements of each column for summing in row adder 430 to form X_c . The second and third row elements are likewise summed to provide Y_c and Z_c ." *Id.* at ll. 23-28. As seen in the Figure, the Row Multiplexer 424 multiplexes four data channels into a single output. Therefore, we find that the MUX 416x and the Row Multiplexer 424 multiplex data channels.

9. Communicating to Remote Location

The examiner finds that in Marsh, "the processed, displayed images . . . [are] communicated to the display from the processor using the communications lines shown in Figure 1. . . ." (Examiner's Answer at 32-33.) Regarding claims 136, 137, 238, 409, and 417, the appellant argues, "Marsh in Fig. 1 does not show a 'data link' and certainly not the specific claim limitations of communicating with a data link." (Reply Br. at 298-99.)

a. Claim Construction

The appellant argues the remote location limitations of claims 136, 137, 238, 409, and 417 as a group. (Reply Br. at 298-99.) We select the limitations of the middle claim as representative of the group. Claim 238 recites in pertinent part the following limitations: "communicating the multiplexed channels of frames of data compressed digital output image information to a remote location. . . ." Giving the claim its broadest, reasonable construction, the limitations require communicating data to a remote location.

b. Obviousness Determination

In Marsh's flight simulation system, "[a] simulated aircraft 14 is linked to . . . visual system 12 through computer linkage 18." Col. 2, ll. 24-26. As mentioned regarding the obviousness rejection over Marsh alone, the visual system comprises the image processor 42 and the display generator 44. *Id.* at ll. 29-30. "The image processor translates initial position data into the aircraft coordinate system; then rotates, clips, and projects each three-dimensional position vector to form two-dimensional display vectors. Raster scanlines are generated from the display vectors V_d of each face for display on a CRT." Abs., ll. 25-31. Figure 1A shows that the simulated aircraft and its CRTs 82 are remote from the visual system with its image processor and display generator. When the image processor and display generator are

communicating raster scanlines to the CRTs of the simulated aircraft, we find that Marsh is communicating data to a remote location.

Furthermore, we agree with the appellant that Widergren discloses a "long distance communications capability. . . ." (Reply Br. at 307.) Persuaded that teachings from Marsh and Widergren would have suggested the claimed subject matter to a person of ordinary skill in the art, we affirm the obviousness rejection of claim 136, 137, 238, 409, and 417.

CONCLUSION

In summary, the rejection of claims 441, 443, 447, 450, 456, 462, 466, 473, 479, 483, 486, 490, 492, 497, 500, 502, 506, 511, 514, 521, 527, 530, 533, 536, 538, 542, 545, 551, 558, 563, 570, 576, 579, 582, 585, 590, 593, 598, 603, 606, 612, 627, 635, 638, 642, 647, 650, 653, 662, 674, 679, 690, 693, 700, 704, 707, 711, 717, 719, 723, 728, 733, 736, 740, 744, 748, 750, 755, 758, and 763 under § 112, ¶ 2, is reversed. The rejection of claim 21 under § 112, ¶ 1, as lacking a written description is also reversed. In contrast, the rejection of claims 31, 131, 132, 136, 137, 207-209, 219-221, 231-233, 238-240, 259-261, 278-280, 409-614, 625-663, 668-681, and 687-771 under § 112, ¶ 1, as lacking a written description is affirmed.

The rejection of claims 21, 31, 131, 132, 136, 137, 207-209, 219-221, 231-233, 238-240, 259-261, 278-280, 409-440, 442-445, 447-455, 458-460, 462-466, 468-473, 475-477, 479-489, 492-495, 497-504, 506-509, 511-521, 523-525, 527-530, 532-535, 538-545, 547-551, 553-556, 558-569, 572-574, 576-579, 581-584, 586-589, 591-597, 599-602, 604-606, 608-611, 613, 614, 625, 626, 628-631, 633-635, 637-646, 648-650, 652-661, 663, 668-673, 675-681, 687, 688, 690-692, 695-698, 700-712, 714-716, 718-720, 722-740, 742-744, 746-749, 751-769, and 771 under § 112, ¶ 1, as non-enabled is reversed. In contrast, the rejection of claims 441, 446, 456, 457, 461, 467, 474, 478, 490, 491, 496, 505, 510, 522, 526, 531, 536, 537, 546, 552, 557, 570, 571, 575, 580, 585, 590, 598, 603, 607, 612, 627, 632, 636, 647, 651, 662, 674, 689, 693, 694, 699, 713, 717, 721, 741, 745, 750, and 770 under § 112, ¶ 1, as non-enabled is affirmed. The rejections of claims 21, 31, 131, 132, 136, 137, 207-209, 219-221, 231-233, 238-240, 259-261, 278-280, 409-614, 625-663, 668-681, and 687-771 under § 103(a) are also affirmed.

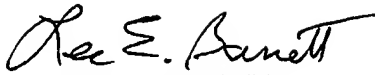
"Any arguments or authorities not included in the brief will be refused consideration by the Board of Patent Appeals and Interferences. . . ." 37 C.F.R. § 1.192(a). Accordingly, our affirmance is based only on the arguments made in the briefs. Any arguments or authorities omitted therefrom are neither before us nor at issue but are considered waived. *Cf. In re Watts*, 354 F.3d 1362, 1367, 69 USPQ2d

1453, 1457 (Fed. Cir. 2004) ("[I]t is important that the applicant challenging a decision not be permitted to raise arguments on appeal that were not presented to the Board.")

No time for taking any action connected with this appeal may be extended under 37

C.F.R. § 1.136(a).

AFFIRMED


LEE E. BARRETT
Administrative Patent Judge


MICHAEL R. FLEMING
Administrative Patent Judge


LANCE LEONARD BARRY
Administrative Patent Judge

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Appeal No. 2003-0525
Application No. 08/457,728

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**Ex parte Hyatt, Decision on Rehearing, Appeal No. 2003-0525,
in patent application Serial No. 08/457,728
(PTO Bd. App. Nov. 30, 2004) (unpublished PTO decision)**

UNITED STATES PATENT AND TRADEMARK OFFICE

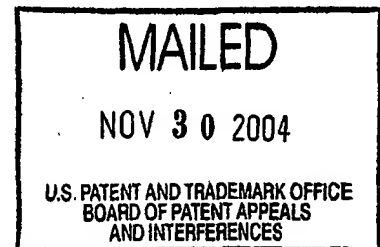
**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

709

Ex parte GILBERT P. HYATT

Appeal No. 2003-0525
Application No. 08/457,728

HEARD: July 15, 2004



Before BARRETT, FLEMING, and BARRY, *Administrative Patent Judges*.
BARRY, *Administrative Patent Judge*.

DECISION ON REQUEST FOR REHEARING

A patent examiner rejected claims 21, 31, 131, 132, 136, 137, 207-209, 219-221, 231-233, 238-240, 259-261, 278-280, 409-614, 625-663, 668-681, and 687-771. The appellant appealed; we affirmed. *Ex parte Hyatt*, No. 2003-0525, slip op. at 1 (Bd.Pat.App. & Int. July 30, 2004). Pursuant to 37 C.F.R. § 41.52(a)(1), the appellant now asks us to reconsider our affirmance of some of the examiner's rejections. (Req. Reh'g at 1.)

OPINION

We address the contested rejections in the following order:

- written description rejection of claims 31, 131, 132, 136, 137, 207, 209, 219, 221, 231, 233, 238, 240, 259, 261, 278, 280, 409-439, 444, 449, 454, 459, 464, 465, 470, 471, 476, 481, 482, 487, 488, 493, 494, 499, 503, 508, 513, 518, 519, 524, 529, 534, 535, 539, 544, 549, 553, 555, 560-562, 567, 568, 578, 583, 588, 592, 596, 601, 605, 610, 625, 630, 634, 639, 643, 644, 649, 654, 659, 660, 672, 668, 676, 677, 687, 692, 697, 702, 706, 710, 714, 718, 722, 726, 730, 734, 738, 742, 747, 752, 757, 762, and 767
- enablement rejection of claims 441, 446, 456, 457, 461, 467, 474, 478, 490, 491, 496, 505, 510, 522, 526, 531, 536, 537, 546, 552, 557, 570, 571, 575, 580, 585, 590, 598, 603, 607, 612, 627, 632, 636, 647, 651, 662, 674, 689, 693, 694, 699, 713, 717, 721, 741, 745, 750, and 770
- obviousness rejection of claim 31 over U.S. Patent No. 4,179,824 ("Marsh")
- obviousness rejection of claims 21, 131, 132, 136, 137, 207-209, 219-221, 231-233, 238-240, 259-261, 278-280, 409-577, 639-663, 668-671, 676-681, and 687-771 over Marsh and U.S. Patent No. 4,302,775 ("Widergren").

A. WRITTEN DESCRIPTION REJECTION OF CLAIMS 31, 131, 132, 136, 137, 207, 209, 219, 221, 231, 233, 238, 240, 259, 261, 278, 280, 409-439, 444, 449, 454, 459, 464, 465, 470, 471, 476, 481, 482, 487, 488, 493, 494, 499, 503, 508, 513, 518, 519, 524, 529, 534, 535, 539, 544, 549, 553, 555, 560-562, 567, 568, 578, 583, 588, 592, 596, 601, 605, 610, 625, 630, 634, 639, 643, 644, 649, 654, 659, 660, 668, 672 676, 677, 687, 692, 697, 702, 706, 710, 714, 718, 722, 726, 730, 734, 738, 742, 747, 752, 757, 762, AND 767

At the outset, we remind the appellant that "when filing an amendment [he] should show support in the original disclosure for new or amended claims." M.P.E.P. § 2163.II.3(b) (8th ed., Aug. 2001). Here, claims 31, 131, 132, 136, 137, 207, 209, 219, 221, 231, 233, 238, 240, 259, 261, 278, 280, 409-439, 444, 449, 454, 459, 464, 465, 470, 471, 476, 481, 482, 487, 488, 493, 494, 499, 503, 507, 508, 513, 518, 519, 524, 529, 534, 535, 539, 544, 549, 553, 555, 560-562, 567, 568, 573, 578, 583, 588, 592, 596, 601, 605, 610, 625, 630, 634, 639, 643, 644, 649, 654, 655 659, 660, 668, 672 676, 677, 687, 692, 697, 702, 706, 710, 714, 718, 722, 726, 730, 734, 738, 742, 747, 752, 757, 762, and 767 are all new claims filed by an amendment. (Paper No. 2.) Had the appellant shown support in his original disclosure for each of the new claims **when he filed the amendment**, he might have preempted a written description rejection thereof.

Nonetheless, we previously found that claims 31, 131, 132, 136, 137, 207, 209, 219, 221, 231, 233, 238, 240, 259, 261, 278, 280, 409-439, 444, 449, 454, 459, 464,

465, 470, 471, 481, 482, 487, 488, 493, 494, 499, 503, 50, 508, 513, 518, 519, 524, 529, 534, 535, 539, 544, 549, 553, 555, 560-562, 567, 568, 578, 583, 588, 592, 596, 601, 605, 610, 625, 630, 634, 639, 643, 644, 649, 654, 659, 660, 668, 672 676, 677, 687, 692, 697, 702, 706, 710, 714, 718, 722, 726, 730, 734, 738, 742, 747, 752, 757, 762, and 767 stood or fell with representative claim 476. *Hyatt*, at 8-9. The appellant now "refer[s] to the comments of the District Court on this issue in the pending action under 35 USC 145 that the Appellant is pursuing regarding copending applications. See the Request To Have The Claims Considered Individually. . . ." (Req. Reh'g at 1.)

"[T]o assure separate review by the Board of individual claims within each group of claims subject to a common ground of rejection, an appellant's brief to the Board must contain a clear statement for each rejection: (a) asserting that the patentability of claims within the group of claims subject to this rejection do not stand or fall together, and (b) identifying which individual claim or claims within the group are separately patentable and the reasons why the examiner's rejection should not be sustained." *In re McDaniel*, 293 F.3d 1379, 1383, 63 USPQ2d 1462, 1465 (Fed. Cir. 2002) (citing 37 C.F.R. §1.192(c)(7) (2001)). "Merely pointing out differences in what the claims cover is not an argument as to why the claims are separately patentable." 37 C.F.R.

§ 1.192(c)(7) (2001). Rather, "[f]or each rejection under 35 U.S.C. 112, first paragraph, the argument shall specify the errors in the rejection and how the first paragraph of 35 U.S.C. 112 is complied with, including, as appropriate, how the specification and drawings, if any, . . . [d]escribe the subject matter defined by each of the rejected claims. . . ." 37 C.F.R. § 1.192(c)(8)(i)(a)(2001). "If the brief fails to meet either requirement, the Board is free to select a single claim from each group of claims subject to a common ground of rejection as representative of all claims in that group and to decide the appeal of that rejection based solely on the selected representative claim." *McDaniel*, 293 F.3d at 1383, 63 USPQ2d at 1465.

Here, although the appellant alleged that "[t]he claims do not stand or fall together," (Appeal Br. at 8), he failed to satisfy the second requirement. As explained in our original opinion, *Hyatt*, at 8, the appellant's summaries of what claims 31, 131, 132, 136, 137, 207, 209, 219, 221, 231, 233, 238, 240, 259, 261, 278, 280, 409-439, 444, 449, 454, 459, 464, 465, 470, 471, 481, 482, 487, 488, 493, 494, 499, 503, 508, 513, 518, 519, 524, 529, 534, 535, 539, 544, 549, 553, 555, 560-562, 567, 568, 578, 583, 588, 592, 596, 601, 605, 610, 625, 630, 634, 639, 643, 644, 649, 654, 659, 660, 668, 672 676, 677, 687, 692, 697, 702, 706, 710, 714, 718, 722, 726, 730, 734, 738, 742, 747, 752, 757, 762, and 767 cover, (Ex. 3), do not constitute an argument why the

claims are separately patentable. As also explained in our original opinion, *Hyatt*, at 8, his allegation that the examiner's rejection did "not establish why the express disclosure of the limitations in th[ese] claim[s] does not satisfy § 112-1," (*id.* at 1), moreover, do not challenge the rejection of the individual claims "with any reasonable specificity. . . ." *In re Nielsen*, 816 F.2d 1567, 1572, 2 USPQ2d 1525, 1528 (Fed. Cir. 1987).

Because the appellant failed to satisfy the second requirement, we were free to select a single claim from the aforementioned group of claims, which were subject to a common written description rejection, as representative of all claims in that group and to decide the appeal of that rejection based solely on that claim. We selected claim 476 from the group and decided the appeal of the written description rejection of those claims based solely on that claim. *Hyatt*, at 8-9, 12-15.

Because the comments now referred to by the appellant are from a hearing on a motion in a **pending** action involving a **different** patent application, moreover, we do not find them relevant to the appeal of this patent application. Therefore, we maintain that claims 31, 131, 132, 136, 137, 207, 209, 219, 221, 231, 233, 238, 240, 259, 261, 278, 280, 409-439, 444, 449, 454, 459, 464, 465, 470, 471, 481, 482, 487, 488, 493,

494, 499, 503, 50, 508, 513, 518, 519, 524, 529, 534, 535, 539, 544, 549, 553, 555, 560-562, 567, 568, 578, 583, 588, 592, 596, 601, 605, 610, 625, 630, 634, 639, 643, 644, 649, 654, 659, 660, 668, 672 676, 677, 687, 692, 697, 702, 706, 710, 714, 718, 722, 726, 730, 734, 738, 742, 747, 752, 757, 762, and 767 stand or fall with representative claim 476.

With this representation in mind, we address the appellant's remaining argument regarding the written description rejection. Specifically, he offers "[a] first (information content) example claim reading [of claim 476]," (Req. Reh'g at 7), and "[a] second (Fig. 1A) example claim reading. . . ." (*Id.* at 9.)

"[C]ompliance with the 'written description' requirement of §112 is a question of fact. . . ." *Vas-Cath, Inc. v. Mahurkar*, 935 F.2d 1555, 1563, 19 USPQ2d 1111, 1116 (Fed. Cir. 1991) (citing *In re Gosteli*, 872 F.2d 1008, 1012, 10 USPQ2d 1614, 1618 (Fed. Cir. 1989); *Utter v. Hiraga*, 845 F.2d 993, 998, 6 USPQ2d 1709, 1714 (Fed. Cir. 1988)). "Although [the applicant] does not have to describe exactly the subject matter claimed, . . . the description must clearly allow persons of ordinary skill in the art to recognize that [he or she] invented what is claimed." *Id.*, 19 USPQ2d at 1116 (quoting *Gosteli*, 872 F.2d 1008, 1012, 10 USPQ2d 1614, 1618 (Fed. Cir. 1989)). "[T]he test for

sufficiency of support . . . is whether the disclosure of the application relied upon 'reasonably conveys to the artisan that the inventor had possession at that time of the later claimed subject matter.'" *Ralston Purina Co. v. Far-Mar-Co., Inc.*, 772 F.2d 1570, 1575, 227 USPQ 177, 179 (Fed. Cir. 1985) (quoting *In re Kaslow*, 707 F.2d 1366, 1375, 217 USPQ 1089, 1096 (Fed. Cir. 1983)). "Application sufficiency under §112, first paragraph, must be judged as of the filing date [of the application]." *Vas-Cath*, 935 F.2d at 1566, 19 USPQ2d at 1119 (citing *United States Steel Corp. v. Phillips Petroleum Co.*, 865 F.2d 1247, 1251, 9 USPQ2d 1461, 1464 (Fed. Cir. 1989)).

Here, representative claim 476 recites the following limitations.

A process comprising the acts of:

storing a database comprising a plurality of data compressed frames of topographical altitude information, each of a plurality of the data compressed frames of topographical altitude information comprising a plurality of data compressed blocks of topographical altitude information, each of a plurality of the data compressed blocks of topographical altitude information representing a data compressed block of topographical altitude information;

generating an accessed data compressed frame of topographical altitude information in response to the plurality of data compressed frames of topographical altitude information, the accessed data compressed frame of topographical altitude information comprising a plurality of accessed data compressed blocks of topographical altitude information, each of a plurality of the accessed data compressed blocks of topographical altitude information representing an accessed data compressed block of topographical altitude information;

generating a data decompressed frame of topographical altitude information in response to the accessed data compressed frame of topographical altitude information, the data decompressed frame of topographical altitude information comprising a plurality of data decompressed blocks of topographical altitude information; and

displaying a topographically shadowed image in response to the plurality of data decompressed blocks of topographical altitude information.

(Emphasis added.) Accordingly, the limitations specify, *inter alia*, that a database stores compressed frames of topographical, altitude information, wherein each of the compressed frames comprises compressed blocks of topographical, altitude information.

Turning to the appellant's specification, his reading of the claim points to various passages scattered throughout his 586-page specification. Although each passage may disclose "bits and pieces of the claim[]," Hyatt, at 19, none discloses all the pieces united to constitute the "claim[] as a whole." *Id.*

For example, the appellant argues that passages from pages 434 and 447-448 of his specification teach "storing of topographical altitude information in a database memory. . . ." (Req. Reh'g at 7.) The passage from page 434 mentions that "altitude information . . . can be stored in the database memory, such as for topological occulting

and shadowing." In contrast, the passage from pages 447-448 mentions that "topographical constant altitude lines can be stored in the database," rather than in "the database memory" of the former passage. Neither passage, moreover, teaches that topographical, altitude information is stored as compressed frames wherein each of the compressed frames comprises compressed blocks.

The appellant also argues that **different passages from different pages**, viz., pages 37, 38, 138, 381, 422, and 486, of his specification teach that information stored in a database memory "can be in the form of frames. . . ." (Req. Reh'g at 7.) Although these passages may mention that frames can be stored in a database, none of the passages teaches that the frames are stored in the "database memory" or the "database" respectively mentioned in the aforementioned passages from pages 434 and 447-448 of the specification. To the contrary, the passages from pages 37 and 38 refer to a different "database memory 131B." (Spec. at 37-38.) Furthermore, none of the passages from pages 37, 38, 138, 381, 422, and 486 teaches that frames represent the topographical, altitude information mentioned in the aforementioned passages from pages 434 and 447-448 of the specification. Nor do any of the passages from pages 37, 38, 138, 381, 422, and 486 teach that the frames are compressed and that each of the compressed frames comprises compressed blocks.

The appellant further argues that a **different passage** from page 40¹ of his specification teaches that "frame[s] can be composed of blocks of information. . . ." (Req. Reh'g at 8.) The passage merely mentions, however, that an "[i]mage memory 131D can store multiple frames of information in mosaic form." (Spec. at 40.) The image memory 131D is a different element from the "database memory 131B," the "database memory," or the "database" respectively mentioned in the aforementioned passages from pages 37-38, 434, and 447-448 of the specification. Furthermore, the passage from page 40 does not teach that the "multiple frames" represent the topographical, altitude information mentioned in the aforementioned passages from pages 434 and 447-448 of the specification. Nor does the passage from page 40 teach that the "multiple frames" are compressed and that each of the compressed frames comprises compressed blocks.

For these reasons, we still find that the disclosure fails to reasonably convey to the artisan that the appellant had possession of the invention of claim 476, particularly of the claimed "storing a database comprising a plurality of data compressed frames of topographical altitude information, each of a plurality of the data compressed frames of

¹Although the appellant cites to page "38" of his specification, (Req. Reh'g at 8), the passage to he quotes, (*id.*), is from page 40 of the specification. Having filed a 586-page specification, the appellant's citations need to be precise and accurate.

topographical altitude information comprising a plurality of data compressed blocks of topographical altitude information, each of a plurality of the data compressed blocks of topographical altitude information representing a data compressed block of topographical altitude information" as of the filing date of his application. Therefore, we maintain our affirmance of the written description rejection of claim 476 and of claims 31, 131, 132, 136, 137, 207, 209, 219, 221, 231, 233, 238, 240, 259, 261, 278, 280, 409-439, 444, 449, 454, 459, 464, 465, 470, 471, 481, 482, 487, 488, 493, 494, 499, 503, 507, 508, 513, 518, 519, 524, 529, 534, 535, 539, 544, 549, 553, 555, 560-562, 567, 568, 573, 578, 583, 588, 592, 596, 601, 605, 610, 625, 630, 634, 639, 643, 644, 649, 654, 655, 659, 660, 668, 672, 676, 677, 687, 692, 697, 702, 706, 710, 714, 718, 722, 726, 730, 734, 738, 742, 747, 752, 757, 762, and 767, which fall therewith.

B. ENABLEMENT REJECTION OF CLAIMS 441, 446, 456, 457, 461, 467, 474, 478, 490, 491, 496, 505, 510, 522, 526, 531, 536, 537, 546, 552, 557, 570, 571, 575, 580, 585, 590, 598, 603, 607, 612, 627, 632, 636, 647, 651, 662, 674, 689, 693, 694, 699, 713, 717, 721, 741, 745, 750, AND 770

The appellant argues that we "affirmed the enablement rejection of the non-'general product claims' solely because [we] affirmed the written description rejection of these claims." (Req. Reh'g at 14.) Such an affirmance, he alleges, "misapprehended or overlooked [an] apparent Board policy -- to reverse a 35 USC 112-1 enablement

rejection when the reason is that the enablement rejection stands or falls with a written description rejection." (*Id.*)

"General rules should not be deduced from the fact situations in one or two cases. . . ." *In re N.A.D., Inc.* 754 F.2d 996, 999, 224 USPQ 969, 971 (Fed. Cir. 1985). "It misinterprets precedent to convert a fact finding that with others supported a decision into a universal requirement for all future cases." *Arrowhead Industrial Water, Inc. v. Ecolochem, Inc.*, 846 F.2d 731, 738, 6 USPQ2d 1685, 1691 (Fed. Cir. 1988). "[A] fertile source of error in patent law is the misapplication of a sound legal principle established in one case to another case in which the facts are essentially different and the principle has no application whatsoever." *In re Ruscetta*, 255 F.2d 687, 689, 118 USPQ 101, 103 (CCPA 1958).

Here, the appellant generalizes non-precedential, unpublished opinions involving different fact situations to an "apparent Board policy," (Req. Reh'g at 14), for the instant appeal. No such policy exists. Instead we decide an appeal based on the specific issues and facts of that appeal. To wit, "[t]o be enabling under §112, a patent must contain a description that enables one skilled in the art to make and use the claimed invention." *Atlas Powder Co. v. E. I. Du Pont de Nemours & Co.*, 750 F.2d 1569, 1576,

224 USPQ 409, 413 (Fed. Cir. 1984) (citing *Raytheon Co. v. Roper Corp.*, 724 F.2d 951, 960, 220 USPQ 592, 599 (Fed. Cir. 1983)).

Here, exemplifying the appellant's "making a product" limitations, dependent claim 446 recites "[a] process as set forth in claim 444, further comprising the act of making a filter product in response to the plurality of output data compressed blocks of image information." For its part, independent claim 444 recites the following limitations:

A process comprising the acts of:

storing a database comprising a plurality of data compressed mosaics of image information, each of a plurality of the data compressed mosaics of image information comprising a plurality of data compressed blocks of image information, each of a plurality of the data compressed blocks of image information representing a two dimensional 64-sample data compressed block of image information;

generating an accessed data compressed mosaic of image information in response to the plurality of data compressed mosaics of image information, the accessed data compressed mosaic of image information comprising a plurality of accessed data compressed blocks of image information, each of a plurality of the accessed data compressed blocks of image information representing an accessed two dimensional 64-sample data compressed block of image information; and

communicating a plurality of output data compressed blocks of image information to a remote location in response to the plurality of accessed data compressed blocks of image information, each of a plurality of the output data compressed blocks of image information representing an output two dimensional 64-sample data compressed block of image information.

In the dependent claim, the limitations "further comprising" and "in response to" evidence that the act of "making a filter product" is an additional act in the process of the independent claim. The product does not result from the process of the parent claim; it results from some additional act of "making."

Turning to the specification, the appellant asserted, "[t]he disclosure has more than 200 occurrences of 'filter' terminology." (Reply Br. at 168.) As explained in our original opinion, *Hyatt*, at 21, however, the appellant fails to explain meaning of the claimed "filter product" or how it relates to the "filter terminology" of the specification. Although the specification discusses "[a] spatial filter arrangement," (Spec. at 162), for example, the arrangement is not described as being made "in response to the plurality of output data compressed blocks of image information."

In summary, the appellant has not shown that the specification describes either the claimed "filter product" or the claimed act of "making" the filter product in response to output data compressed blocks of image information. Without knowing the identity of the claimed products or acts, we are still unpersuaded that the specification would have enabled one skilled in the art to make and use the claimed products without undue experimentation. Therefore, we maintain our affirmation of the enablement rejection of

claims 441, 446, 456, 457, 461, 467, 474, 478, 490, 491, 496, 505, 510, 522, 526, 531, 536, 537, 546, 552, 557, 570, 571, 575, 580, 585, 590, 598, 603, 607, 612, 627, 632, 636, 647, 651, 662, 674, 689, 693, 694, 699, 713, 717, 721, 741, 745, 750, and 770.

C. OBVIOUSNESS REJECTION OF CLAIM 31 over Marsh

We address the appellant's following points of contention:

- lookahead circuit
- coupling an image memory loading circuit coupling
- storing, loading, and processing a database image.

1. Lookahead Circuit

The appellant argues, "Marsh does not call any of his circuits a lookahead circuit." (Req. Reh'g at 22.) In addressing the point of contention, the Board conducts a two-step analysis. First, we construe the representative claim at issue to determine its scope. Second, we determine whether the construed claim would have been obvious.

a. Claim Construction

"Analysis begins with a key legal question — *what is the invention claimed?*"

Panduit Corp. v. Dennison Mfg. Co., 810 F.2d 1561, 1567, 1 USPQ2d 1593, 1597 (Fed.

Cir. 1987). In answering the question, "the Board must give claims their broadest reasonable construction. . . ." *In re Hyatt*, 211 F.3d 1367, 1372, 54 USPQ2d 1664, 1668 (Fed. Cir. 2000).

Here, claim 31 recites in pertinent part the following limitations: "a lookahead circuit generating lookahead information. . . ." Giving the claim its broadest, reasonable construction, the limitations require a circuit that looks ahead to generate information.

b. Obviousness Determination

Having determined what subject matter is being claimed, the next inquiry is whether the subject matter would have been obvious. The question of obviousness is "based on underlying factual determinations including . . . what th[e] prior art teaches explicitly and inherently. . . ." *In re Zurko*, 258 F.3d 1379, 1383, 59 USPQ2d 1693, 1696 (Fed. Cir. 2001) (citing *Graham v. John Deere Co.*, 383 U.S. 1, 17-18, 148 USPQ 459, 467 (1966); *In re Dembiczak*, 175 F.3d 994, 998, 50 USPQ 1614, 1616 (Fed. Cir. 1999); *In re Napier*, 55 F.3d 610, 613, 34 USPQ2d 1782, 1784 (Fed. Cir. 1995)).

"A *prima facie* case of obviousness is established when the teachings from the prior art itself would appear to have suggested the claimed subject matter to a person of ordinary skill in the art." *In re Bell*, 991 F.2d 781, 783, 26 USPQ2d 1529, 1531 (Fed.

Cir. 1993) (quoting *In re Rinehart*, 531 F.2d 1048, 1051, 189 USPQ 143, 147 (CCPA 1976)).

Here, Marsh's "FIG. 1 shows a flight simulation system 10 with visual capabilities provided by a digital visual system 12." Col. 2, ll. 22-24. The "[v]isual system 12 is formed by image processor 42 and display generator 44. General purpose computer 40 (i.e., a PDP 11/35 from Digital Equipment Corporation) coordinates flight data and terrain data through interface controller 46 into translation stage 60 via a data buffer." *Id.* at ll. 29-34. More specifically, the "GP computer 40 . . . receives terrain data (both natural formations and cultural structures) from data base 48 such as runaways, towers, hangers, roads, rivers, fields, moving objects, etc." *Id.* at ll. 37-41. The "GP computer 40 has an in-core, buffer memory which accumulates blocks of image data required to form each display frame." Col. 3, ll. 26-28. "The image data accumulating in the in-core buffer is periodically transferred as a data block to hardware RAM buffer 304 in interface controller 46." *Id.* at ll. 32-34.

Once stored therein, the interface "[c]ontroller 46 processes the data words sequentially to image processor 42. . . ." *Id.* at ll. 34-36. While the interface controller is "processing" the data words to the image processor, the "GP computer 40

simultaneously assembles the next data block in the in-core buffer for the next data handshake with RAM 304." *Id.* at ll. 36-38. Because the GP computer assembles a next data block for a future transfer while the image controller processes current data, we find that the GP computer, which includes circuitry, is looking ahead to a future transfer, viz., the next transfer. Therefore, we are still persuaded that it would have suggested the claimed "lookahead circuit."

2. Coupling an Image Memory Loading Circuit

Noting that "claim 31 further limits the image memory loading circuit to being 'coupled to the database memory and coupled to the image memory,'" (Req. Reh'g at 24), the appellant argues, "Marsh does not clearly teach such features." (*Id.*)

As mentioned regarding the prior point of contention, Marsh's GP computer 40 loads image data from the data base 48 into an internal buffer. Because Marsh's GP computer loads image data from the data base, and the computer subsequently transfers the image data to the image memory, we find that the GP computer constitutes an image memory loading circuit. As also mentioned regarding the prior point of contention, the image data in the buffer are periodically transferred to the RAM (i.e., the random access memory) buffer 304 of the interface controller, which we

previously found to constitute an image memory. *Hyatt*, at 34. Figure 1 of the reference, moreover, shows that the GP computer 40 is coupled to the database 48 and to the interface controller 46, which includes the RAM buffer 304, of the reference.

3. Storing, Loading, and Processing a Database Image

Admitting that "Marsh[] mention[s] . . . a database," (Req. Reh'g at 21), the appellant argues, "Marsh does not teach the claimed storing of 'a database image' in a database memory. . . ." (*Id.*) Noting that "claim 31 further limits the image memory to 'storing a portion of the database image,'" (*id.* at 22), he further argues, "[t]he Board has overlooked these important limitations associated with the construction of the claimed image memory." (*Id.*) Also noting that "claim 31 further limits the image memory loading circuit to . . . loading 'the portion of the database image stored by the database memory into the image memory,'" (*id.* at 24), the appellant further argues, "Marsh does not clearly teach such features." (*Id.*) In addition, he argues, "Marsh does not teach the claimed processing of a portion of the database image. . . ." (*Id.* at 25.)

"A party cannot wait until after the Board has rendered an adverse decision and then present new arguments in a request for reconsideration." *Cooper v. Goldfarb*, 154 F.3d 1321, 1331, 47 USPQ2d 1896, 1904 (Fed. Cir. 1998) (citing *Moller v. Harding*, 214

USPQ 730, 731 (Bd. Pat. App. & Int. 1982), *aff'd*, 714 F.2d 160 (Fed. Cir. 1983) (table)). An argument advanced in a request for reconsideration but not previously advanced in a brief or reply brief "is not properly before us." *Ex parte Hindersinn*, 177 USPQ 78, 80 (Bd. Pat. App. & Int. 1971).

Here, the appellant has filed, *inter alia*, a 154-page appeal and a 309-page reply brief. Nowhere in these briefs, however, did he argue that the image data stored in Marsh's database are not a "database image," that the image data transferred from the database to the reference's RAM buffer are not a portion of the "database image," or that the image data processed by Marsh's image processor are not a portion of the "database image." In our original opinion, moreover, we notified that appellant that "our affirmance [wa]s based only on the arguments made in the briefs. Any arguments or authorities omitted therefrom are neither before us nor at issue but are considered waived." *Hyatt*, at 54-55 (citing *In re Watts*, 354 F.3d 1362, 1367, 69 USPQ2d 1453, 1457 (Fed. Cir. 2004)). Accordingly, we decline to address the appellant's new arguments. *Cf. Pentax Corp. v. Robison*, 135 F.3d 760, 762 (Fed. Cir. 1998) ("[W]e decline to address the government's new theory raised for the first time in its petition for rehearing. See *United States v. Bongiorno*, 110 F.3d 132, 133 (1st Cir. 1997) ('[A] party may not raise new and additional matters for the first time in a petition for rehearing.');");

Wells v. Rushing, 760 F.2d 660, 661 (5th Cir.1985) (citing cases supporting the proposition that issues not raised before the court are not addressed on rehearing)."). Therefore, we maintain our affirmance the obviousness rejection of claim 31.

D. Obviousness Rejection of Claims 21, 131, 132, 136, 137, 207-209, 219-221, 231-233, 238-240, 259-261, 278-280, 409-577, 639-663, 668-671, 676-681, and 687-771 over Marsh and Widergren

The appellant argues, that "[t]he Board dismisses the Appellant's significant arguments in the briefs regarding the issue of stand or fall together for the 35 USC 103 rejections (Decision at 39)." (Req. Reh'g at 2.) As explained in our original opinion, *Hyatt*, at 39, however, the appellant's summaries of what claims 131, 132, 137, 207-209, 219-221, 231-233, 239, 240, 259-261, 278-280, 410-416, 418, 420, 421, 423-425, 427, 430, 431, 433-458, 460-577, 639-663, 668-671, 676-681, and 687-771 cover, (Ex. 3), do not constitute an argument why the claims are separately patentable. As also explained in our original opinion, *Hyatt*, at 39, the appellant's mere allegations that the examiner's rejection does not establish the "obviousness of this combination of limitations, nor the obviousness of the recited cooperation between limitations in th[ese] claim[s]," (*id.* at 1), moreover, does not challenge the rejection of the individual claims with any reasonable specificity.

Because the appellant failed to satisfy the second requirement, we were free to select a single claim from the aforementioned group of claims, which were subject to a common obviousness rejection, as representative of all claims in that group and to decide the appeal of that rejection based solely on that claim. We selected claim 21 from the group and decided the appeal of the obviousness rejection of those claims based solely on that claim. *Hyatt*, at 39-42. Still persuaded that teachings from Marsh and Widergren would have suggested the claimed subject matter to a person of ordinary skill in the art, we maintain our affirmance of the obviousness rejection of claim 21 and of claims 131, 132, 137, 207-209, 219-221, 231-233, 238-240, 259-261, 278-280, 410-416, 418, 420, 421, 423-425, 427, 430, 431, 433-458, 460-577, 639-663, 668-671, 676-681, and 687-771, which fall therewith.

We now address the appellant's following points of contention regarding the following claims that were argued separately:

- relational database of claims 409-417, 426-430, and 432
- topological altitude information and shadowing of claims 419 and 459
- mosaics of claims 432 and 459
- multilevel memory of claim 422
- multiplexing of claim 136
- communicating to remote location of claims 136, 137, 238, and 417.

1. Relational Database of Claims 409-417, 426-430, and 432

Regarding independent claims 409, 426, 428, 429, and 432, (Reply Br. at 294), the appellant argues that our "contention that spatially related terrain data readers obvious the claimed 'relational database' is contradicted by the art recognized meaning thereof." (Req. Reh'g at 25.) He offers "Exhibit-8," (*id.*), as evidence of that meaning.

a. Claim Construction

Claim 409, 426, 428, 429, and 432 recites in pertinent part the following limitations: a "relational database. . . ." For its part, Exhibit-8 explains that "a relational database is a network database in which the relationships are handled in a very specific way." *Encyclopedia of Computer Science and Engineering* 444 (2d ed. 1983). Specifically, "a relationship between two record types [must] be expressed implicitly by means of having a data item in each record type (in relational terminology, an *attribute* in each relation) take its values from a common domain of values." *Id.* "[I]n one of the two record types, the item (or items) on which the relationship is based must serve as a unique primary key for that record type." *Id.*

Interpreting the limitations in view of the explanation, claim 409, 426, 428, 429, and 432 require a network database in which a relationship between two record types is

expressed implicitly by having a data item in each record type (i.e., an attribute in each relation) take its values from a common domain of values. In one of the two record types, the item (or items) on which the relationship is based serves as a unique primary key for that record type.

b. Obviousness Determination

The examiner does not allege, let alone show, that in Marsh's database a relationship between two record types is expressed implicitly by having a data item in each record type (i.e., an attribute in each relation) take its values from a common domain of values or that in one of the two record types, the item (or items) on which the relationship is based serves as a unique primary key for that record type. Not does he allege, let alone show, that Widergren cures the aforementioned deficiency of Marsh. Therefore, we reverse the obviousness rejection of claim 409; of claims 410-417, which depend from claim 409; of claim 426; of claim 427, which depends from claim 426; of claim 428; of claim 429; of claim 430, which depends from claim 429; and of claim 432.

2. Topological Altitude Information and Shadowing of Claims 419 and 459

Regarding claims 419 and 459, (Reply Br. at 296), the appellant argues, "Marsh does not call any of his features 'topographical altitude' or 'topographical shadowed'

features despite the fact that topographical, altitude, and shadow were well known terms of art. *This is prima facie proof that Marsh did not consider that any of his features was 'topographical', 'altitude', or 'shadowed' features. . . .*" (Req. Reh'g at 26.)

a. Claim Construction

The appellant argues the topographical altitude information limitations of claims 419 and 459 as a group. (Reply Br. at 295-96.) We select the limitations of the former claim as representative of the group. Claim 419 recites in pertinent part the following limitations: "storing a database comprising . . . topographical altitude information. . . ."

"[L]imitations are not to be read into the claims from the specification." *In re Van Geuns*, 988 F.2d 1181, 1184, 26 USPQ2d 1057, 1059 (Fed. Cir. 1993) (citing *In re Zletz*, 893 F.2d 319, 321, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989)). Here, contrary to the appellant's argument, the limitations do not require that the information in the database be topographically shadowed.

Furthermore, "argument of counsel cannot take the place of evidence." *In re Budnick*, 537 F.2d 535, 538, 190 USPQ 422, 424 (CCPA 1976) (citing *In re Schulze*,

346 F.2d 600, 145 USPQ 716 (CCPA 1965); *In re Cole*, 326 F.2d 769, 140 USPQ 230 (CCPA 1964)). Here, in contrast to his argument regarding the limitation of a "relational database," *supra*, the appellant offers no evidence of his allegedly well known meaning of "topographical" or "altitude." Giving the representative claim its broadest, reasonable construction, we still conclude that the limitations require that storing information relating to topographical altitude in a database.

b. Obviousness Determination

Anticipation "is not an 'ipsissimis verbis' test," *In re Bond*, 910 F.2d 831, 832, 15 USPQ2d 1566, 1567 (Fed. Cir. 1990)(citing *Akzo N.V.*, 808 F.2d at 1479 & n.11, 1 USPQ2d at 1245 & n.11), "and neither is obviousness." *Hyatt*, at 33. Here, even if Marsh does not literally "call any of his features 'topographical altitude' . . . features," (Req. Reh'g at 26), this choice of words is far from "*prima facie* proof that Marsh did not consider that any of his features was 'topographical', 'altitude'. . . ." (*Id.*)

As explained in our original opinion, *Hyatt*, at 45, moreover, "[t]he terrain data [stored in Marsh's database] . . . includes . . . three dimensional object items formed by polygon faces having shapes orientations and dimensions. . . ." Abs., ll. 1-3.

An example of a three-dimensional object is the hanger shown in Figure 2A as

element 240 and in Figure 11 as element 1110. "[T]he three edges of hanger 1110 are positioned parallel to the three axis [sic] of the object coordinate system," col. 35, ll. 52-54, viz., an x-axis, a y-axis, and a z-axis. Because the z-dimension of the objects represented by the terrain data represents an altitude and a topography, we still find that the reference's database stores information relating to topographical altitude. Therefore, we maintain our affirmance of the obviousness rejection of claim 419.

3. Mosaics of Claims 432 and 459

Regarding claims 432 and 459, (Reply Br. at 302), the appellant argues, "Marsh does not call any of his features a mosaic despite the fact that mosaic was a well known term of art. *This is prima facie proof that Marsh did not consider that any of his features was a mosaic.*" (Req. Reh'g at 26.)

a. Claim Construction

The appellant argues the mosaic limitations of claims 432 and 459 as a group. (Reply Br. at 302-03.) We select the limitations of the latter claim as representative of the group. Claim 459 recites in pertinent part the following limitations: "a database comprising a plurality of data compressed mosaics of topographical altitude information. . . ." In contrast to his argument regarding the limitation of a "relational database,"

supra, the appellant offers no evidence of his allegedly well known meaning of "mosaic." Giving the representative claim its broadest, reasonable construction, we still conclude that the limitations require storing mosaics in a database.

b. Obviousness Determination

Even if Marsh does not literally "call any of his features a mosaic," (Req. Reh'g at 26), this choice of words is far from "*prima facie* proof that Marsh did not consider that any of his features was a mosaic." (*Id.*)

As explained in our original opinion, *Hyatt*, at 48, three-dimensional objects stored in Marsh's database, abs., ll. 1-3, are combined to form a "scene." Col. 1, l. 18. For example, the scene shown in Figure 2A includes a hanger and a flagpole. Furthermore, the reference may aggregate runaways, towers, hangers, roads, rivers, fields, and moving objects, col. 2, ll. 39-41, to form a different scene. Because the objects stored in the database are aggregated to form scenes, we find that the database stores mosaics. Therefore, we maintain our affirmance of the obviousness rejection of claim 459 and of claim 432, which falls therewith.

4. Multilevel Memory of Claim 422

Regarding claim 422, (Reply Br. at 304), the appellant argues, "Marsh does not teach the claimed multi-bit per cell memory and Marsh does not call any of his features by this terminology despite the fact that memory cell was a well known term of art. *This is prima facie proof that Marsh did not consider that any of his features was a multi-bit memory cell.*" (Req. Reh'g at 27.)

a. Claim Construction

Claim 422 does not recite a "multi-bit memory cell." Instead, the claim recites in pertinent part the following limitations: "an integrated circuit multilevel memory having a plurality of multilevel memory cells, each of the plurality of multilevel memory cells storing at least two digital bits of information in a plurality of levels. . . ." In contrast to his argument regarding the limitation of a "relational database," *supra*, the appellant offers no evidence of his allegedly well known meaning of "multi-bit memory cell." Giving the claim its broadest, reasonable construction, we still conclude that the limitations require memory cells storing at least two digital bits of information in levels.

b. Obviousness Determination

As explained in our original opinion, *Hyatt*, at 49, the passage of Marsh cited by the examiner discloses that "[p]rior to each training flight, the content of data base 48 is loaded into computer 40 core-memory. Image data from data base 4[8] includes sixteen control words (0000-1111) having bit formats as described hereinafter, initialization data V_0 , delta data, etc." Col. 3, ll. 45-49. The database and the core-memory represent different levels of memory. Because the control words stored therein comprise multiple bits of information, moreover, we still find that the cells of the database and the core-memory store at least two digital bits of information in levels. Therefore, we maintain our affirmance of the obviousness rejection of claim 422.

5. Multiplexing of Claim 136

The appellant argues, "the claimed multiplexers are recited in a novel claim combination and have novel limitations that are no tught [sic] by Marsh (e.g., claim 136). . . ." (Req. Reh'g at 27.)

Because the appellant originally argued the multiplexing limitations of claims 136, 137, and 238 as a group, (Reply Br. at 301-302), we were free to select a single claim from the group of claims, which were subject to a common obviousness

rejection, as representative of all claims in that group and to decide the appeal of that rejection based solely on that claim. We selected claim 238 from the group and decided the appeal of the obviousness rejection of those claims based solely on that claim. *Hyatt*, at 50-51. It is too late for the appellant to argue the patentability of claim 136 separately.

6. Communicating to Remote Location of Claims 136, 137, 238, and 417

Regarding claims 136, 137, 238, and 417, (Reply Br. at 298-99), the appellant argues, "the Board then contradicts well known art recognized meaning by contending that Marsh's simulated aircraft on a display is in some inexplicable way remote." (Req. Reh'g at 27.)

a. Claim Construction

As explained in our original opinion, *Hyatt*, at 52, the appellant argues the remote location limitations of claims 136, 137, 238, and 417 as a group. (Reply Br. at 298-99.) We selected the limitations of the claim 238 as representative of the group. Claim 238 recites in pertinent part the following limitations: "communicating the multiplexed channels of frames of data compressed digital output image information to a remote location. . . ." In contrast to his argument regarding the limitation of a

"relational database," *supra*, the appellant offers no evidence of his allegedly well known meaning of "remote." Giving the claim its broadest, reasonable construction, we still conclude that the limitations require communicating data to a remote location.

b. Obviousness Determination

As explained in our original opinion, *Hyatt*, at 52-53, in Marsh's flight simulation system, "[a] simulated aircraft 14 is linked to . . . visual system 12 through computer linkage 18." Col. 2, ll. 24-26. The visual system comprises the image processor 42 and the display generator 44. *Id.* at ll. 29-30. "The image processor translates initial position data into the aircraft coordinate system; then rotates, clips, and projects each three-dimensional position vector to form two-dimensional display vectors. Raster scanlines are generated from the display vectors Vd of each face for display on a CRT." *Abs.*, ll. 25-31. Figure 1A shows that the simulated aircraft and its CRTs 82 are remote from the visual system with its image processor and display generator. When the image processor and display generator are communicating raster scanlines to the CRTs of the simulated aircraft, we still find that Marsh is communicating data to a remote location.

Furthermore, we still agree with the appellant that Widergren discloses a "long distance communications capability. . . ." (Reply Br. at 307.) Persuaded that teachings from Marsh and Widergren would have suggested the claimed subject matter to a person of ordinary skill in the art, we maintain our affirmance of the obviousness rejection of claim 238, and of claims 136, 137, 409, and 417, which fall therewith.

CONCLUSION

In summary, we grant the appellant's request to reverse the rejection of claims 409-417, 426-430, and 432 under § 103(a). In contrast, we deny his request to reverse the rejection of claims 31, 131, 132, 136, 137, 207, 209, 219, 221, 231, 233, 238, 240, 259, 261, 278, 280, 409-439, 444, 449, 454, 459, 464, 465, 470, 471, 476, 481, 482, 487, 488, 493, 494, 499, 503, 508, 513, 518, 519, 524, 529, 534, 535, 539, 544, 549, 553, 555, 560-562, 567, 568, 578, 583, 588, 592, 596, 601, 605, 610, 625, 630, 634, 639, 643, 644, 649, 654, 659, 660, 668, 672, 676, 677, 687, 692, 697, 702, 706, 710, 714, 718, 722, 726, 730, 734, 738, 742, 747, 752, 757, 762, and 767 under § 112, ¶ 1, as lacking a written description; the rejection of claims 441, 446, 456, 457, 461, 467, 474, 478, 490, 491, 496, 505, 510, 522, 526, 531, 536, 537, 546, 552, 557, 570, 571, 575, 580, 585, 590, 598, 603, 607, 612, 627, 632, 636, 647, 651, 662, 674, 689, 693, 694, 699, 713, 717, 721, 741, 745, 750, and 770 under § 112, ¶ 1, as non-

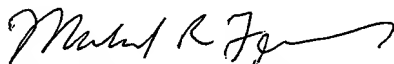
enabled; and the rejections of claims 21, 31, 131, 132, 136, 137, 207-209, 219-221, 231-233, 238-240, 259-261, 278-280, 418-425, 431, and 433-577, 639-663, 668-671, 676-681, and 687-771 under § 103(a).

"Any arguments or authorities not included in the brief will be refused consideration by the Board of Patent Appeals and Interferences. . . ." 37 C.F.R. § 1.192(a) (2001). Accordingly, we again remind the appellant that our affirmance is based only on the arguments made in his briefs. Any arguments or authorities omitted therefrom are neither before us nor at issue but are considered waived. *Cf. In re Watts*, 354 F.3d 1362, 1367, 69 USPQ2d 1453, 1457 (Fed. Cir. 2004) ("[I]t is important that the applicant challenging a decision not be permitted to raise arguments on appeal that were not presented to the Board."). No time for taking any action connected with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

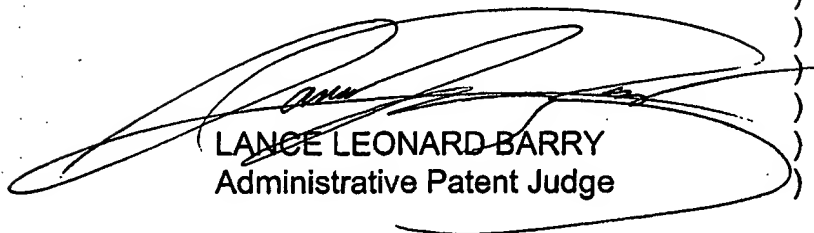
GRANTED-IN-PART



LEE E. BARRETT
Administrative Patent Judge



MICHAEL R. FLEMING
Administrative Patent Judge



LANCE LEONARD BARRY
Administrative Patent Judge

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Appeal No. 2003-0525
Application No. 08/457,728

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GILBERT P HYATT
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**Ex parte Hyatt, Decision on Appeal No. 2005-1005,
in patent application Serial No. 08/458,104
(PTO Bd. App. Nov. 22, 2005) (unpublished PTO decision)**

UNITED STATES PATENT AND TRADEMARK OFFICE

**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Ex parte GILBERT P. HYATT

Appeal No. 2005-1005
Application No. 08/458,104

HEARD: Sep. 15, 2005

11/22/05

Before BARRETT, GROSS, and BARRY, *Administrative Patent Judges*.
BARRY, *Administrative Patent Judge*.

A patent examiner rejected claims 115-151, 161-310, 315-326, and 335-440.
(Final Rej. at 1.) The appellant does not appeal the rejection of claims 142-144,
148-150, 168-170, 186-188, 374, 378, or 403-405. (Supp. Appeal Br. at 7.) He does,
however, appeal the rejection of claims 115-141, 145-147, 151, 161-167, 171-185,
189-310, 315-326, 335-373, 375-377, 379-402, and 406-440 under 35 U.S.C. § 134(a).
We affirm.

I. BACKGROUND

The appellant describes the invention at issue on appeal as "a [sic] interpolation or extrapolation system. . . ." (Appeal Br. at 7.)¹ A further understanding of the invention can be achieved by reading the following claims.

115. A system comprising:

- an input circuit generating input image information;

- a first memory storing first image information;

- a second memory;

- a second memory input circuit coupled to the input circuit and coupled to the second memory, the second memory input circuit inputting second image information into the second memory in response to the input image information generated by the input circuit, the second memory storing the second image information;

- an extrapolation processor coupled to the first memory, the extrapolation processor generating extrapolated image information in response to the first image information stored in the first memory;

- a spatial domain interpolation processor coupled to the first memory and coupled to the second memory, the spatial domain interpolation processor generating spatial interpolated image information in response to the first image information stored in the first memory and in response to the second image information stored in the second memory;

¹We are puzzled that the appellant's title and abstract omit any mention of interpolation and extrapolation and that his Summary of the Invention, (Spec. at 4), omits any mention of extrapolation.

a temporal interpolation processor coupled to the spatial domain interpolation processor, the temporal interpolation processor generating temporal interpolated image information in response to the spatial interpolated image information generated by the spatial domain interpolation processor; and

a coefficient processor coupled to the extrapolation processor and coupled to the temporal interpolation processor, the coefficient processor generating coefficient image information related to variations between pixels in response to the extrapolated image information generated by the extrapolation processor and in response to the temporal interpolated image information generated by the temporal interpolation processor.

117. A system as set forth in claim 115,

wherein the temporal interpolation processor is an interlaced temporal interpolation processor generating the temporal interpolated image information as interlaced temporal interpolated image information; and

wherein the extrapolation processor is an interlaced extrapolation processor generating the extrapolated image information as interlaced extrapolated image information.

118. A process comprising the acts of:

generating interlaced input image information;

storing first interlaced image information in a first memory;

inputting second interlaced image information into a second memory in response to the interlaced input image information;

storing the second interlaced image information in the second memory;

generating interlaced extrapolated image information in response to the first interlaced image information stored in the first memory;

generating interlaced temporal interpolated image information in response to the first interlaced image information stored in the first memory and in response to the second interlaced image information stored in the second memory; and

generating interlaced coefficient image information related to variations between pixels in response to the interlaced extrapolated image information and in response to the interlaced temporal interpolated image information.

119. A system comprising:

an input circuit generating first image information and generating second image information;

a processor generating extrapolated image information in response to the first image information;

a processor generating spatial interpolated image information in response to the first image information and in response to the second image information;

a processor generating temporal interpolated image information in response to the spatial interpolated image information; and

a processor generating bandwidth reduced image information in response to the extrapolated image information and in response to the temporal interpolated image information.

122. A process comprising the acts of:

storing first image information in a memory;

storing second image information in the memory;

generating extrapolated image information in response to the first image information stored in the memory;

generating temporal interpolated image information in response to the first image information stored in the memory and in response to the second image information stored in the memory; and

generating spatial frequency reduced image information in response to the extrapolated image information and in response to the temporal interpolated image information.

151. A system comprising:

an interlaced input circuit generating interlaced data compressed input image information;

a processor generating interlaced data decompressed image information in response to the interlaced data compressed input image information;

a processor generating interlaced frequency domain coefficient image information in response to the interlaced data decompressed image information;

a processor generating pixel image information in response to the interlaced frequency domain coefficient image information;

a processor generating interlaced temporal interpolated pixel image information in response to the pixel image information;

a processor generating interlaced extrapolated pixel image information in response to the pixel image information;

a memory; and

a memory input circuit writing interlaced output pixel image information into the memory in response to the interlaced temporal interpolated pixel image information and in response to the interlaced extrapolated pixel image information, the memory storing the interlaced output pixel image information.

228. A process comprising the acts of:

generating input image information;

storing first image information in a first memory;

inputting second image information into a second memory in response to the input image information;

storing the second image information in the second memory;

generating extrapolated image information in response to the first image information stored in the first memory;

generating spatial interpolated image information in response to the first image information stored in the first memory and in response to the second image information stored in the second memory; and

generating coefficient image information related to variations between pixels in response to the extrapolated image information and in response to the spatial interpolated image information.

Claims 115-141, 145-147, 151, 161-167, 171-185, 189-310, 315-326, 335-373, 375-377, 379-402, and 406-440, all the claims on appeal, stand rejected under 35 U.S.C. § 112, ¶ 1, as lacking a written description and under § 112, ¶ 1, as non-enabled. Claims 115-141, 145-147, 151, 161-167, 171-185, 189-310, 315-326,

335-373, 375-377, 379-402, 406-421, 425-431, and 435-440, most of the claims on appeal, also stand rejected under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 4,245,248 ("Netravali") and U.S. Patent No. 4,179,824 ("Marsh"), with U.S. Patent No. 3,996,673 ("Vorst") and U.S. Patent No. 4,563,703 ("Taylor") merely "cited . . . as evidence to support the examiner's taking of Official Notice. . . ." (Examiner's Answer at 54-55.)

II. OPINION

Our opinion addresses the rejections in the following order:

- written description rejection
- enablement rejection
- obviousness rejection.

A. WRITTEN DESCRIPTION REJECTION

At the outset, we remind the appellant that "[t]he applicant is in the best position to explain his invention, especially where the claims are unusually lengthy or complex."

Hyatt v. Dudas, No. 03-108 (EGS), slip op. at 26 (D.D.C. 2005). This is why an

"[a]pplicant should . . . specifically point out the support for any amendments made to the disclosure." M.P.E.P. § 2163.06 (6th ed., Rev. 2, July 1996).²

Here, as emphasized by the examiner, "[t]he claims on [a]ppeal are all newly added claims with new limitations. There are no original claims remaining in the application." (Examiner's Answer at 8.) Had the appellant shown support in his original disclosure for each of the new claims **when he filed his amendments**, he might have preempted a written description rejection thereof. Unfortunately, the appellant chose not to do so.³

The examiner's rejection for lack of written description followed. This is not the situation, however, where an examiner failed to address all the claims or failed to point to specific limitations that lacked written description. To the contrary, the examiner identified specific limitations in all the claims that he found to lack written description.

²We quote from the version of the M.P.E.P. in effect when the appellant filed his appeal brief.

³To the contrary, the "[a]ppellant's discussion of claim 118 in the 'Summary of the Invention' of the Brief is the first time in the prosecution history of this application that he has presented any specific remarks directed to where he believes he has support for any specific claim, even though the claims have repeatedly been rejected under 35 U.S.C. 112, first paragraph." (Examiner's Answer at 67.)

(Examiner's Answer at 8-44.) Consequently, the "burden of coming forward with evidence or argument shift[ed] to the [appellant]." *In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992).

On appeal, "to assure separate review by the Board of individual claims within each group of claims subject to a common ground of rejection, an appellant's brief to the Board must contain a clear statement for each rejection: (a) asserting that the patentability of claims within the group of claims subject to this rejection do not stand or fall together, and (b) identifying which individual claim or claims within the group are separately patentable and the reasons why the examiner's rejection should not be sustained." *In re McDaniel*, 293 F.3d 1379, 1383, 63 USPQ2d 1462, 1465 (Fed. Cir. 2002) (citing 37 C.F.R. §1.192(c)(7) (2001)). "Merely pointing out differences in what the claims cover is not an argument as to why the claims are separately patentable." 37 C.F.R. § 1.192(c)(7) (2000).⁴ Rather, "[f]or each rejection under 35 U.S.C. 112, first paragraph, the argument shall specify the errors in the rejection and how the first paragraph of 35 U.S.C. 112 is complied with, including, as appropriate, how the specification and drawings, if any, . . . [d]escribe the subject matter defined by each of

⁴We quote from the version of the C.F.R in effect when the appellant filed his appeal brief.

the rejected claims. . . ." *See id.* § 1.192(c)(8)(i)(A). "If the brief fails to meet either requirement, the Board is free to select a single claim from each group of claims subject to a common ground of rejection as representative of all claims in that group and to decide the appeal of that rejection based solely on the selected representative claim." *McDaniel*, 293 F.3d at 1383, 63 USPQ2d at 1465.

Here, although the appellant alleges that "[t]he claims do not stand or fall together," (Appeal Br. at 9), he fails to satisfy the second requirement. His summaries of what claims 115-117, 119-124, 126-128, 132, 133, 135-141, 145-147, 151, 171-179, 189-191, 198-200, 202-204, 211-241, 244-258, 263-278, 283-290, 295-298, 307-310, 318-326, 335, 338, 341, 344, 347, 356, 357, 359, 370, 373, 380-391, 393, 394, 396, 397, 399-402, 406-420, and 431-440 cover, (Supp. Appeal Br. at 13-194), do not constitute an argument **under 37 C.F.R. § 1.192(c)(7)** that the claims are separately patentable. Merely alleging that the examiner's rejection does "not establish why the express disclosure of the limitations in th[ese] claim[s] does not satisfy § 112-1," (Supp. Appeal Br. at 13), moreover, does not challenge the rejection of the individual claims "with any reasonable specificity. . . ." *In re Nielsen*, 816 F.2d 1567, 1572, 2 USPQ2d 1525, 1528 (Fed. Cir. 1987).

Although the appellant also identifies parts of the specification that contain certain terms appearing in limitations that the examiner found to lack written description (Reply Br. at 46-52), the identification does not constitute a separate argument for patentability because the appellant neither addresses the limitations as a whole, including the interconnections of elements and steps, nor identifies the claims in which those limitations appear. Because claim 118 is the only claim that the appellant argues specifically and fully, the aforementioned claims should be treated as "falling" therewith in accordance with 37 C.F.R. § 1.192(c)(7) and *McDaniel*. In other words, if the rejection of claim 118 is affirmed, the rejection of the aforementioned claims should also be affirmed.

Because the examiner addresses the lack of written description for specific limitations in the other aforementioned claims, however, these claims should not "stand" with claim 118. In other words, if the rejection of claim 118 is reversed, the rejection of the aforementioned other claims should not be reversed *pro forma*. To the contrary, if an adequate written description is found for claim 118, the examiner's specific findings of a lack of written description for all the other claims must be considered. In the interest of equity, we review these findings and reverse the

associated rejections that are insufficient on their face. In view of the aforementioned principles, we address the claims in the following order:

- non-product claims shown to lack written description
- non-product claims not shown to lack written description
- product claims corresponding to static photographs
- product claims not corresponding to static photographs.

1. Non-product Claims Shown to Lack Written Description

Rather than reiterate the positions of the examiner or the appellant *in toto*, we focus on the points of contention therebetween, which follow:

- interlaced input image information
- inputting second interlaced image information in response to the interlaced input image information
- generating interlaced extrapolated image information in response to first interlaced image information stored in a first memory
- generating interlaced temporal interpolated image information in response to the first interlaced image information stored in the first memory and in response to second interlaced image information stored in a second memory
- generating interlaced coefficient image information in response to the interlaced extrapolated image information and in response to the interlaced temporal interpolated image information
- generating temporal interpolated image information in response to spatial interpolated image information

- generating bandwidth reduced image information in response to extrapolated image information and in response to interpolated image information
- generating spatial frequency reduced image information in response to extrapolated image information and in response to temporal interpolated image information
- interlaced frequency domain coefficient image information
- reduced redundancy and reconstructed redundancy image information.

a. Interlaced input image information

The examiner finds that "the generation of an 'interlaced image' is not actually stated in the specification. . . ." (Examiner's Answer at 68-69.) The appellant argues, "The experimental system (e.g.; pages 240-373 and 544-574) implements interlaced scan (e.g.; page 243-244, 266, 544-546) with interlaced sync signal chip MM5321 (e.g.; Fig.6T; pages 366-367)." (Appeal Br. at 8 n.4.)

In addressing the point of contention, the Board conducts a two-step analysis. First, we construe the claim at issue to determine its scope. Second, we determine whether the construed claim has adequate support.

i. Claim Construction

"Analysis begins with a key legal question — what is the invention claimed?"

Panduit Corp. v. Dennison Mfg. Co., 810 F.2d 1561, 1567, 1 USPQ2d 1593, 1597 (Fed. Cir. 1987). Here, representative claim 118 and independent claim 213 recite in pertinent part the following limitations: "generating interlaced input image information. . . ." Similarly, independent claim 151 recites in pertinent part the following limitations: "generating interlaced data compressed input image information. . . ." Accordingly, claims 118, 151, and 213 require generating input image information that is interlaced.

ii. Support Determination

"[C]ompliance with the written description requirement is a question of fact."

Hyatt v. Boone, 146 F.3d 1348, 1352, 47 USPQ 2d 1128, 1130 (Fed. Cir. 1998) (citing *Vas-Cath, Inc. v. Mahurkar*, 935 F.2d 1555, 1563, 19 USPQ2d 1111, 1116 (Fed. Cir. 1991)). "It is well established that 'the written description must include all of the limitations of the [claim], or the applicant must show that any absent text is necessarily comprehended in the description provided and would have been so understood at the time the patent application was filed.'" *Hyatt v. Dudas*, No. 03-0901 (HHK), slip op. at 18 (D.D.C. 2005) (quoting *Hyatt*, 146 F.3d at 1354, 47 USPQ 2d 1132). "[T]he test for

sufficiency of support . . . is whether the disclosure of the application relied upon 'reasonably conveys to the artisan that the inventor had possession at that time of the later claimed subject matter.'" *Ralston Purina Co. v. Far-Mar-Co., Inc.*, 772 F.2d 1570, 1575, 227 USPQ 177, 179 (Fed. Cir. 1985) (quoting *In re Kaslow*, 707 F.2d 1366, 1375, 217 USPQ 1089, 1096 (Fed. Cir. 1983)). "Application sufficiency under §112, first paragraph, must be judged as of the filing date [of the application]." *Vas-Cath*, 935 F.2d at 1566, 19 USPQ2d at 1119 (citing *United States Steel Corp. v. Phillips Petroleum Co.*, 865 F.2d 1247, 1251, 9 USPQ2d 1461, 1464 (Fed. Cir. 1989)).

Here, the examiner's finding that "the generation of an 'interlaced image' is not actually stated in the specification," (Examiner's Answer at 68-69), is uncontested.⁵ The parts of the specification cited by the appellant mention that "[a]n interlaced scan arrangement is used for the [appellant's] experimental system," (Spec. at 243), and that a "frame sync pulse occurs once per field, twice per frame, in the interlaced scan system as implemented with the demonstration system," (*id.* at 244); list a computer program that "describes that the interlaced scan calculations are to be processed and describes the input binary bits for interlaced scan control," (*id.* at 266); and explain that

⁵The appellant's '[s]ilence implies assent.'" *Ex parte Knapton*, 67 USPQ2d 1059, 1060 (Bd.Pat.App. & Int. 2002) (quoting *Harper & Row Publishers, Inc. v. Nation Enters.*, 471 U.S. 539, 572, 225 USPQ 1073, 1085 (1985)).

"[a] synchronization signal generator is implemented with a National Semiconductor MM5321 component." (*Id.* at 366.) None of the parts, however, mentions the claimed "interlaced input image information." With no mention of the claimed "interlaced input image information," let alone the generation thereof, we find that the specification fails to reasonably convey to the artisan that, as of the filing date of his application, the appellant had possession of the claimed "generating interlaced input image information" or the claimed "generating interlaced data compressed input image information. . . ." Therefore, we affirm the rejection of claims 118, 151, and 213 for lacking a written description of the aforementioned limitations and of claims 124, 214, 337, 350, 363, and 370, which depend therefrom.

b. Inputting second interlaced image information
in response to the interlaced input image information

The examiner observes that the "[a]ppellant does not point to anything for support for this limitation." (Examiner's Answer at 70.)

i. Claim Construction

Representative claim 118 and independent claim 213 recite in pertinent part the following limitations: "inputting second interlaced image information into a second memory in response to the interlaced input image information. . . ." As emphasized by

the examiner, these limitations require that the "'inputting second interlaced image information' be performed 'in response to the interlaced input image information'." (*Id.*) "Claims must be read in view of the specification, of which they are a part." *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979, 34 USPQ2d 1321, 1329 (Fed. Cir. 1995). Unfortunately, the appellant's specification omits an explanation of the responsive inputting. Absent such a disclosure, we are uncertain what it means to input the second interlaced image information "in response to" the interlaced input image information.

ii. Support Determination

As aforementioned, the "[a]ppellant does not point to anything for support for this limitation." (*Id.*) Such an omission leaves us in a quandary where to search for support in the appellant's 576-page specification. In particular, the appellant points to nothing in his specification that describes inputting the claimed "second interlaced image information . . . **in response to** the interlaced image information." (Emphasis added.) With no mention of the claimed "second interlaced image information," let alone the inputting thereof "in response to" the "interlaced image information" as claimed, we find that the specification fails to reasonably convey to the artisan that, as of the filing date of his application, the appellant had possession of the claimed "inputting second

interlaced image information into a second memory in response to the interlaced input image information. . . ." Therefore, we affirm the rejection of claims 118 and 213 for lacking a written description of the aforementioned limitations and of claims 124, 214, 337, 350, 363, and 370, which depend therefrom.

c. Generating interlaced extrapolated image information
in response to first interlaced image information stored in a first memory

The appellant cites "pages 435-438" of his specification. (Appeal Br. at 8.) The examiner finds, "while the term[] 'extrapolation' . . . appear[s] on these pages, the term[] . . . 'interlace(d)' do[es] not." (Examiner's Answer at 81.)

i. Claim Construction

Dependent claim 117 recites in pertinent part the following limitations: "generating the extrapolated image information as **interlaced** extrapolated image information." (Emphasis added.) Similarly, representative claim 118 recites in pertinent part the following limitations: "generating **interlaced** extrapolated image information **in response to** the first interlaced image information stored in the first memory. . . ." (Emphases added.) Accordingly, claims 117 and 118 require generating extrapolated image information that is interlaced, and the latter claim also requires that

the generating be in response to first interlaced image information stored in a first memory.

ii. Support Determination

The part of the specification cited by the appellant explains that an "image can be . . . extrapolated from points in a 2-dimensional arrangement. . . ." (Spec. at 436.) As noted by the examiner, however, the part does not mention the term "interlace(d)," (Examiner's Answer at 81), let alone disclose that the extrapolated image is an "interlaced" image as claimed. Nor does the part of the specification cited by the appellant mention, let alone describe, extrapolating "in response to" first interlaced image information stored in a first memory as claimed. With no mention of the claimed "interlaced extrapolated image information," let alone the generation thereof "in response to" first interlaced image information stored in a first memory as claimed, we find that the specification fails to reasonably convey to the artisan that, as of the filing date of his application, the appellant had possession of the claimed "generating the extrapolated image information as interlaced extrapolated image information" or the claimed "generating interlaced extrapolated image information in response to the first interlaced image information stored in the first memory. . . ." Therefore, we affirm the

rejection of claims 117 and 118 for lacking a written description of the aforementioned limitations and of claims 124 and 370, which depend therefrom.

d. Generating interlaced temporal interpolated image information
in response to the first interlaced image information stored in the first memory and
in response to second interlaced image information stored in a second memory

The appellant cites "pages 248 and 435-438" of his specification. (Appeal Br. at 8.) The examiner finds that "none of the elements cited by Appellant are disclosed as 'generating interlaced temporal interpolated image information in response to the first interlaced image information stored in the first memory and in response to the second interlaced image information stored in the second memory'" (Examiner's Answer at 79.)

i. Claim Construction

Claims 117, 121, 128, 141, 147, 151, 212, 213, 218, 222, 227, 244, 248, 252, 256, and 257 recite in pertinent part the following limitations: "**interlaced temporal interpolated image information.**" (Emphasis added.) Similarly, representative claim 118 recites in pertinent part the following limitations: "generating **interlaced temporal interpolated image information in response to** the first interlaced image information stored in the first memory and **in response to** the second interlaced image information

stored in the second memory. . . ." (Emphases added.) Accordingly, claims 117, 118, 121, 128, 141, 147, 151, 212, 213, 218, 222, 227, 244, 248, 252, 256, and 257 require generating image information that is interlaced and temporal interpolated, and claim 118 further requires that the generation be in response to both first interlaced image information stored in a first memory and second interlaced image information stored in a second memory.

ii. Support Determination

The latter part of the specification cited by the appellant teaches that an "image can be interpolated between points . . . in a 2-dimensional arrangement. . . ." (Spec. at 436.) This part, however, does not disclose that this interpolation is "temporal" as claimed. The former part of the specification cited by the appellant teaches "a temporal domain interpolation" that "generates the initial conditions for an 8-field period and then interpolates in between the 8-field period to obtain the initial conditions for each field." (*Id.* at 248.) Neither part of the specification, however, discloses that the interpolation involves an "interlaced image" as claimed. Nor does either part mention, let alone describe, that its interpolation is performed "in response to" first interlaced image information stored in a first memory and second interlaced image information stored in a second memory as claimed. With no mention of the claimed "interlaced temporal

interpolated image information," let alone the generation thereof "in response to" both first interlaced image information stored in a first memory and second interlaced image information stored in a second memory as claimed, we find that the specification fails to reasonably convey to the artisan that, as of the filing date of his application, the appellant had possession of the claimed "interlaced temporal interpolated image information" or the claimed "generating interlaced temporal interpolated image information in response to the first interlaced image information stored in the first memory and in response to the second interlaced image information stored in the second memory. . . ." Therefore, we affirm the rejection of claims 117, 118, 121, 128, 141, 147, 151, 212, 213, 218, 222, 227, 244, 248, 252, 256, and 257 for lacking a written description of the aforementioned limitations and of claims 124, 214, 258, 337, 350, 363, and 370, which depend therefrom.

e. Generating interlaced coefficient image information in response to the interlaced extrapolated image information and in response to the interlaced temporal interpolated image information

The appellant cites "pages 435-438" of his specification. (Appeal Br. at 8.) The examiner finds, "the terms 'extrapolation' and 'interpolation' . . . appear in the form of alternatives. . . ." (Examiner's Answer at 81.)

i. Claim Construction

Independent claim 115 recites in pertinent part the following limitations:

"generating coefficient image information related to variations between pixels in response to the extrapolated image information generated by the extrapolation processor **and** in response to the temporal interpolated image information generated by the temporal interpolation processor." (Emphasis added.) Representative claim 118 recites in pertinent part the following limitations: "generating **interlaced** coefficient image information related to variations between pixels in response to the interlaced extrapolated image information **and** in response to the interlaced temporal interpolated image information." (Emphases added.) Accordingly, claims 115 and 118 require generating coefficient image information in response to **both** the interlaced extrapolated image information **and** the interlaced **temporal** interpolated image information and the latter claim further requires that the coefficient image information is interlaced. Reciting similar limitations, independent claims 198, 213, and 431 require generating coefficient image information in response to **both** extrapolated image information **and temporal** interpolated image information.

Furthermore, independent claim 228 recites in pertinent part the following limitations: "generating coefficient image information related to variations between

pixels in response to the extrapolated image information **and** in response to the spatial interpolated image information." (Emphasis added.) Accordingly, the limitations require generating coefficient image information in response to **both** extrapolated image information **and spatial** interpolated image information.

ii. Support Determination

The part of the specification cited by the appellant teaches that "image points can be stored in the form of coefficients of an interpolation or extrapolation equation to provide interpolation between datapoints or extrapolation from a datapoint." (Spec. at 435.) As noted by the examiner, however, the part does not mention the term "'interlace(d)," (Examiner's Answer at 81), let alone disclose that the coefficients are an interlaced image as claimed. Furthermore, the part of the specification cited by the appellant does not disclose that its coefficients are generated responsive to **both** interlaced extrapolated image information **and** interlaced temporal interpolated image information as claimed. To the contrary, the specification explains that its coefficients result from "an interpolation **or** [an] extrapolation. . . ." (Spec. at 435.) Also, the part does not characterize its interpolation as "temporal" or as "spatial" as claimed.

With no mention of the claimed "interlaced coefficient image information," let alone the generation thereof "in response to" both interlaced extrapolated image information and interlaced temporal interpolated image information or both interlaced extrapolated image information and spatial interpolated image information as claimed, we find that the specification fails to reasonably convey to the artisan that, as of the filing date of his application, the appellant had possession of the claimed "generating interlaced coefficient image information related to variations between pixels in response to the interlaced extrapolated image information and in response to the interlaced temporal interpolated image information"; the claimed "generating coefficient image information related to variations between pixels in response to the extrapolated image information generated by the extrapolation processor and in response to the temporal interpolated image information generated by the temporal interpolation processor"; or the claimed "generating coefficient image information related to variations between pixels in response to the extrapolated image information and in response to the spatial interpolated image information." Therefore, we affirm the rejection of claims 115, 118, 198, 213, 228, and 431 for lacking a written description of the aforementioned limitations and of claims 116, 117, 124, 199-212, 214, 229-231, 324, 325, 335-337, 341, 349, 350, 354, 362, 363, 367, 370, 389-391, and 432-440, which depend therefrom.

f. Generating temporal interpolated image information
in response to spatial interpolated image information

The appellant cites "Spec. at 248. . . ." (Reply Br. at 47.) The examiner finds that certain independent claims "recite either a 'temporal interpolation processor' that is 'generating temporal interpolated image information in response to the spatial interpolated image information' (lines 16-19 of claim 115, for example, with similar recitation in the other apparatus claims) or the process step of 'generating temporal interpolated image information in response to the spatial interpolated information' (claim 189, lines 7-8, for example with similar recitation in the other method claims)." (Examiner's Answer at 28.)

i. Claim Construction

Independent claims 115, 119, 126, 139, 145, 171, 177, 189, 219, 245, 253, 263, 287, 295, 307, 394, and 431 recite in pertinent part the following limitations: "generating temporal interpolated image information **in response to** the spatial interpolated image information." (Emphasis added.) Accordingly, the limitations require generating temporal interpolated image information in response to spatial interpolated image information.

ii. Support Determination

Although the part of the specification cited by the appellant mentions "a temporal domain interpolation" and a "spatial domain interpolation," (Spec. at 248), it does not disclose that temporal interpolated image information is generated responsive to spatial interpolated image information. To the contrary, the part teaches that "temporal domain interpolation" is performed "in contrast to," (*id.*), and "rather than," (*id.*), spatial domain interpolation. With no mention of generating temporal interpolated image information "in response to" spatial interpolated image information as claimed, we find that the specification fails to reasonably convey to the artisan that, as of the filing date of his application, the appellant had possession of the claimed "generating temporal interpolated image information in response to the spatial interpolated image information." Therefore, we affirm the rejection of claims 115, 119, 126, 139, 145, 171, 177, 189, 219, 245, 253, 263, 287, 295, 307, 394, and 431 for lacking a written description of the aforementioned limitations and of claims 116, 117, 120, 121, 127, 128, 140, 141, 146, 147, 172, 173, 178, 179, 190, 191, 220-223, 246-248, 254-256, 264-266, 288-290, 296-298, 308-310, 315, 317, 318, 320, 321, 323, 335, 339, 346, 348, 352, 359, 361, 365, 379, 386-388, and 432-440, which depend therefrom.

g. Generating bandwidth reduced image information in response to extrapolated image information and in response to interpolated image information

The appellant cites "Spec. at . . . 69. . . ." (Reply Br. at 51.) The examiner finds, "Nothing in the original specification the Examiner could find comes close to describing the specifics that are currently claimed, particularly the claimed interconnections and interrelations between the claimed elements." (Examiner's Answer at 37.)

i. Claim Construction

Independent claims 119 and 215 recite in pertinent part the following limitations: "generating bandwidth reduced image information **in response to** the extrapolated image information **and in response to** the temporal interpolated image information." (Emphases added.) Similarly, independent claim 132 recites in pertinent part the following limitations: "generating bandwidth reduced image information **in response to** the extrapolated image information." (Emphasis added.) Independent claim 232 recites in pertinent part the following limitations: "generating bandwidth reduced image information **in response to** the extrapolated image information **and in response to** the spatial interpolated image information." (Emphases added.) Independent claim 245 recites in pertinent part the following limitations "generating bandwidth reduced image information **in response to** the temporal interpolated image information." (Emphasis added.) Accordingly, claims 119, 132, 215, 232, and 245 require generating bandwidth

reduced image information in response to extrapolated image information, temporal interpolated image information, spatial interpolated image information, or some combination thereof.

ii. Support Determination

The part of the specification cited by the appellant mentions that "[s]patial filtering can be implemented as filter preprocessing for reducing spatial frequencies and as filter postprocessing for smoothing images." (Spec. at 51.) It does not disclose, however, that bandwidth reduced image information is generated responsive to extrapolated image information, temporal interpolated image information, spatial interpolated image information, or some combination thereof. With no mention of generating bandwidth reduced image information "in response to" extrapolated image information, temporal interpolated image information, spatial interpolated image information, or some combination thereof as claimed, we find that the specification fails to reasonably convey to the artisan that, as of the filing date of his application, the appellant had possession of the claimed "generating bandwidth reduced image information in response to the extrapolated image information and in response to the temporal interpolated image information"; the claimed "generating bandwidth reduced image information in response to the extrapolated image information"; the claimed

"generating bandwidth reduced image information in response to the extrapolated image information and in response to the spatial interpolated image information"; or the claimed "generating bandwidth reduced image information in response to the temporal interpolated image information." Therefore, we affirm the rejection of claims 119, 132, 215, 232, and 245 for lacking a written description of the aforementioned limitations and of claims 120, 121, 133, 134, 216-218, 233-235, 246-248, 315, 318, 321, 338, 342, 346, 351, 355, 359, 364, 368, and 372, which depend therefrom.

h. Generating spatial frequency reduced image information in response to extrapolated image information and in response to temporal interpolated image information

The appellant cites "Spec. at . . . 175. . . ." (Reply Br. at 50.) The examiner finds, "This is in a section titled 'Spatial Filtering With Geometric Processing' and is not related to the other elements of the claims." (Examiner's Answer at 34.)

i. Claim Construction

Independent claims 122 and 219 recites in pertinent part the following limitations: "generating spatial frequency reduced image information **in response to** the extrapolated image information **and in response to** the temporal interpolated image information." (Emphases added.) Independent claim 135 recites in pertinent part the following limitations: "generating spatial frequency reduced image information

in response to the extrapolated image information and in response to the spatial interpolated image information." (Emphasis added.) Independent claims 145 and 249 recites in pertinent part the following limitations: "generating spatial frequency reduced image information **in response to** the temporal interpolated image information." (Emphasis added.) Independent claim 236 recites in pertinent part the following limitations: "generating spatial frequency reduced image information **in response to** the extrapolated image information." (Emphasis added.) Accordingly, claims 122, 135, 145, 219, 236, and 249 require generating spatial frequency reduced image information in response to extrapolated image information, temporal interpolated image information, spatial interpolated image information, or some combination thereof.

ii. Support Determination

The part of the specification cited by the appellant mentions that "as the image is compressed, the anti-aliasing filter related spatial frequency may be reduced to reduce the detail." (Spec. at 50.) It does not disclose, however, that spatial frequency reduced image information is generated responsive to extrapolated image information, temporal interpolated image information, spatial interpolated image information, or some combination thereof. With no mention of generating spatial frequency reduced image information "in response to" extrapolated image information, temporal interpolated

image information, spatial interpolated image information, or some combination thereof as claimed, we find that the specification fails to reasonably convey to the artisan that, as of the filing date of his application, the appellant had possession of the claimed "generating spatial frequency reduced image information in response to the extrapolated image information and in response to the temporal interpolated image information"; the claimed "generating spatial frequency reduced image information in response to the extrapolated image information and in response to the spatial interpolated image information"; the claimed "generating spatial frequency reduced image information in response to the temporal interpolated image information"; or the claimed "generating spatial frequency reduced image information in response to the extrapolated image information." Therefore, we affirm the rejection of claims 122, 135, 145, 219, 236, and 249 for lacking a written description of the aforementioned limitations and of claims 123, 125, 136, 137, 146, 147, 220-223, 237-239, 250-252, 316, 319, 322, 339, 343, 347, 352, 356, 360, 365, 369, and 373, which depend therefrom.

i. Interlaced frequency domain coefficient image information

The examiner finds, "The terms 'frequency domain coefficient' or 'frequency domain' or 'frequency coefficient' do not appear in the original specification."

(Examiner's Answer at 34-35.) Citing "Spec. at 130-131, 435, 436," (Reply Br. at 49), the appellant argues, "The disclosure has adequate written description of the coefficient claim limitations." (*Id.*)

i. Claim Construction

Independent claims 267, 271, 396, 400, 406, 410, 412, 414, and 417 recite in pertinent part the following limitations: "generating **frequency domain** coefficient image information. . . ." (Emphasis added.) Independent claim 151 recites similar limitations. Accordingly, claims 151, 267, 271, 396, 400, 406, 410, 412, 414, and 417 require generating frequency domain coefficient image information.

ii. Support Determination

Although the parts of the specification cited by the appellant mention "coefficients," none disclose the coefficients as frequency coefficients, let alone frequency domain coefficients. Furthermore, "[s]earching the lengthy specification both manually and electronically, the Examiner could not find any instance of the terms 'frequency' and 'coefficient' appearing anywhere near one another." (Examiner's Answer at 35.) With no mention of the claimed "frequency domain coefficient image information," let alone the generation thereof, we find that the specification fails to

reasonably convey to the artisan that, as of the filing date of his application, the appellant had possession of the claimed "generating frequency domain coefficient image information. . . ." Therefore, we affirm the rejection of claims 151, 267, 271, 396, 400, 406, 410, 412, 414, and 417 for lacking a written description of the aforementioned limitations and of claims 268-270, 272-274, 397-399, 401, 402, 407-409, 411, 413, 415, 416, and 418-420, which depend therefrom.

j. Reduced redundancy and reconstructed redundancy image information

Citing "Spec. at 453, 455," (Reply Br. at 51), the appellant argues, "The disclosure has adequate written description of the reduced redundancy claim limitations." (*Id.*) The examiner finds, "Neither of these citations come close to describing the specifics that are currently claimed, particularly the claimed interconnections and interrelations between the claimed elements." (Examiner's Answer at 36.)

i. Claim Construction

Independent claim 126 recites in pertinent part the following limitations:
"generating redundancy reduced image information **in response to** the extrapolated image information generated by the extrapolation processor and in response to the

temporal interpolated image information generated by the temporal interpolation processor," (emphasis added); independent claim 224 recites similar limitations. Independent claims 138 and 393 recite in pertinent part the following limitations: "generating redundancy reduced image information **in response to** the extrapolated image information." (Emphasis added.) Independent claims 240 and 400 recite in pertinent part the following limitations: "generating redundancy reduced image information **in response to** the extrapolated image information and in response to the spatial interpolated image information." (Emphasis added.) Independent claim 253 recites in pertinent part the following limitations: "generating redundancy reduced image information **in response to** the temporal interpolated image information." (Emphasis added.) Accordingly, claims 126, 138, 224, 240, 253, 393, and 400 require generating redundancy reduced image information in response to extrapolated image information, temporal interpolated image information, spatial interpolated image information, or some combination thereof.

Independent claims 171, 174, and 177 recite in pertinent part the following limitations: "generating image information **having reconstructed redundancies in response to** the data compressed input image information generated by the input circuit." (Emphasis added.) Independent claims 275, 283, 394, and 406 recite similar

limitations. Accordingly, claims 171, 174, 177, 275, 283, 394, and 406 require generating image information having reconstructed redundancies in response to data compressed input image information.

ii. Support Determination

The parts of the specification cited by the appellant mention that data compression "can be achieved by reducing the amount of redundant information communicated," (Spec. at 453), and that "[p]re-processing can take the form of digital filtering to reduce redundancies. . . ." (*Id.* at 455.) Neither part disclose, however, that redundancy reduced image information is generated responsive to extrapolated image information, temporal interpolated image information, spatial interpolated image information, or some combination thereof. Nor does either part disclose generating image information having reconstructed redundancies, let alone in response to data compressed input image information. With no mention of generating redundancy reduced image information in response to extrapolated image information, temporal interpolated image information, spatial interpolated image information, or some combination thereof as claimed or of generating image information having reconstructed redundancies as claimed, we find that the specification fails to reasonably convey to the artisan that, as of the filing date of his application, the

appellant had possession of the claimed "generating redundancy reduced image information in response to the extrapolated image information generated by the extrapolation processor and in response to the temporal interpolated image information generated by the temporal interpolation processor"; the claimed "generating redundancy reduced image information in response to the extrapolated image information"; the claimed "generating redundancy reduced image information in response to the extrapolated image information and in response to the spatial interpolated image information"; the claimed "generating redundancy reduced image information in response to the temporal interpolated image information"; or the claimed "generating image information having reconstructed redundancies in response to the data compressed input image information generated by the input circuit." Therefore, we affirm the rejection of claims 126, 138, 171, 174, 177, 224, 240, 253, 275, 283, 393, 394, 400, and 406 for lacking a written description of the aforementioned limitations and of claims 127, 128, 172, 173, 175, 176, 178, 179, 225-227, 241, 254-256, 276-278, 284-286, 317, 320, 323, 326, 340, 344, 348, 353, 357, 361, 366, 383, 386-388, 401, 402, and 407-409, which depend therefrom.

* * *

In summary, we affirm the written description rejection of claim 118. Claims 115-117, 119-124, 126-128, 132, 133, 135-141, 145-147, 151, 171-179, 189-191, 198-200,

202-204, 211-241, 244-258, 263-278, 283-290, 295-298, 307-310, 318-326, 335, 338, 341, 344, 347, 356, 357, 359, 370, 373, 380-391, 393, 394, 396, 397, 399-402, 406-420, should fall with claim 118 in accordance with 37 C.F.R. § 1.192(c)(7) and *McDaniel* but should be affirmed for the additional reasons stated *supra*.

2. Non-product Claims Not Shown to Lack Written Description

Although claims 129-131, 161, 162, 164, 165, 167, 180, 182-185, 192-197, 242, 243, 259, 261, 262, 279, 281, 282, 291, 293, 294, 299, 301-303, 305, 306, 392, 395, and 421-422-430 should be treated as falling with claim 118, in the interest of equity, we review the individual rejections of these claims. In doing so, we focus on the points of contention between the examiner or the appellant, which follow:

- interpolation processors
- data compression and decompression
- coefficient processor
- claims not addressed by examiner.

a. Interpolation processors

The examiner asserts, "there is absolutely no suggestion of using [interpolation processors] with . . . a 'processor generating coefficient image information' (claim 129, for example). . . ." (Examiner's Answer at 30.) Claim 129, however, recites no

interpolation, let alone "interpolation 'processors.'" (*Id.*) Therefore, we reverse the written description rejection of claim 129.

b. Data compression and decompression

Admitting that "[t]he specification merely mentions the possibility of using compression/decompression and the known properties thereof," (Examiner's Answer at 32), the examiner asserts, "There is no discussion of what type of compression/decompression the system is contemplating." (*Id.*) The appellant argues, "The disclosure has a whole section . . . entitled 'Database Data Compression' (Spec. at 435-438)." (Reply Br. at 52.)

i. Claim Construction

Claim 161 recites in pertinent part the following limitations: "means for generating **data compressed** input image information; [and] means for generating **data decompressed** image information in response to the **data compressed** input image information. . . ." (Emphases added). Claims 162, 165, 180, 183, 192, 195, 259, 279, 291, 299, 303, 395, and 421 recite similar limitations. Accordingly, claims 161, 162, 165, 180, 183, 192, 195, 259, 279, 291, 299, 303, 395, and 421 require data compression, data decompression, or both.

ii. Support Determination

We are unpersuaded that the specification need disclose "what type of compression/decompression the system is contemplating," (Examiner's Answer at 32), to provide adequate support for the claim limitations. Therefore, we reverse the written description rejection of claims 161, 162, 165, 180, 183, 192, 195, 259, 279, 291, 299, 303, 395, and 421.

c. Coefficient processor

The examiner asserts, "The claimed term 'coefficient processor' does not appear in the specification." (Examiner's Answer at 33.) Neither claim 242 nor 392, however, recites a "coefficient processor." (*Id.*) Therefore, we reverse the written description rejection of claims 242 and 392.

d. Claims not addressed by examiner

"For each rejection under 35 U.S.C. 112, first paragraph, the examiner's answer . . . shall explain how the first paragraph of 35 U.S.C. 112 is not complied with, including, as appropriate, how the specification and drawings, if any, (a) do not describe the subject matter defined by each of the rejected claims. . . ." M.P.E.P. § 1208. Here, although the examiner includes claims 130, 131, 164, 167, 182, 184,

185, 193, 194, 196, 197, 243, 261, 262, 281, 282, 293, 294, 301, 302, 305, 306, and 422-430 in his statement of the written description rejection, (Examiner's Answer at 8), his explanation of the rejection, (*id.* at 8-44), fails to address any of these claims. We will not "resort to speculation," *In re Warner*, 379 F.2d 1011, 1017, 154 USPQ 173, 178 (CCPA 1967), as to the examiner's position. Therefore, we reverse the written description rejection of claims 130, 131, 164, 167, 182, 184, 185, 193, 194, 196, 197, 243, 261, 262, 281, 282, 293, 294, 301, 302, 305, 306, and 422-430.

3. Product Claims Corresponding to Static Photographs

Observing that "127 of the pending claims⁶ recite limitations for making 'products' of one type or another," (Examiner's Answer at 38), the examiner finds that "with one exception, variations of the term 'product' (e.g., 'products') [are] used in the specification only in a mathematical sense (such as for multiplication or a sum-of-products)." (*Id.* at 40-41.) The appellant argues, "The disclosure has written description of 'product' claim limitations in combination with other claim limitations." (Reply Br. at 52.)

⁶The examiner should have enumerated all the 127 claims.

a. Claim Construction

Dependent claims 123, 124, 133, 163, 166, 181, 190, 199, 214, 216, 220, 225, 229, 233, 237, 241, 246, 250, 254, 258, 260, 264, 268, 272, 276, 280, 284, 288, 292, 296, 300, 304, 308, 370, 371, 373, 397, 401, 407, 411, 413, 415, 418 recite in pertinent part "making a product." Dependent claim 200 recites in pertinent part "making an information product." Dependent claim 202 recites in pertinent part "making a designed product." Dependent claim 203 recites in pertinent part "making a manufactured product." Dependent claim 204 recites in pertinent part "making a processed product." Dependent claims 318-320 recite in pertinent part "making a design product" and "making a second product." Dependent claims 321-326 recite in pertinent part "making a display product" and "making a second product." Dependent claim 338 recites in pertinent part "making a graphic product." Dependent claims 341, 408, and 419 recite in pertinent part "making a display product." Dependent claim 344 recites in pertinent part "making a data decompressed product." Dependent claim 347 recites in pertinent part "making an entertainment product." Dependent claims 356 and 357 recite in pertinent part "making a communicated product." Dependent claims 358 and 359 recite in pertinent part "making a communication product." Dependent claims 380, 383, 386, and 389 recite in pertinent part "making a first product." Dependent claims 381, 384, 387, and 390 recite in pertinent part "making a second product." Dependent

claims 382, 385, 388, and 391 recite in pertinent part "making a third product."
Dependent claim 399 recites in pertinent part "making a first product" and "making a second product." Dependent claims 402, 409, 416, and 420 recite in pertinent part "making a first product," "making a second product," and "making a third product."

b. Support Determination

The passage of the specification containing the "exception" noted by the examiner discloses that "the final **product** of a graphic art system may be static photographs. . . ." ⁷ (Spec. at 454 ⁸ (emphasis added).) Agreeing with the examiner that the specification lacks written description for any product other than a static photograph, we find that the claimed "making a product," the claimed "making an information product," the claimed "making a designed product," the claimed "making a manufactured product," the claimed "making a processed product," the claimed "making a design product," the claimed "making a second product," the claimed "making a display product," the claimed "making a graphic product," the claimed "making a data decompressed product," the claimed "making an entertainment product," the claimed "making a communicated product," the claimed "making a communication product," the

⁷We are puzzled by the appellant's failure to cite the passage.

⁸The appellant should number the lines of his specifications to facilitate citation thereto.

claimed "making a first product," and the claimed "making a third product" each refers to the disclosed making of static photographs. Therefore, we reverse the written description rejection of claims 163, 166, 181, 260, 280, 292, 300, 304, 358, and 371, which depend from independent claims whose written description rejections have been reversed, *supra*. Because the disclosure of static photographs does not cure the lack of support for the independent claims from which the other aforementioned product claims depend, however, the written description rejection of these claims remains affirmed.

4. Product Claims Not Corresponding to Static Photographs

As aforementioned, the examiner has found that "with one exception, variations of the term 'product' (e.g., 'products') [are] used in the specification only in a mathematical sense (such as for multiplication or a sum-of-products)." (Examiner's Answer at 40-41.) Observing that "pending claims," (*id.* at 38), "recite limitations for making one or more diverse types of products 'in response to' method or apparatus limitations of a parent claim," (*id.* at 40), the examiner further finds, "[t]here is simply no description in the specification, or any depiction in the drawings, of making these claimed 'products'." (*Id.*) The appellant argues, "The disclosure has written description

of 'product' claim limitations in combination with other claim limitations." (Reply Br. at 52.)

a. Claim Construction

Dependent claims 360, 361, 376, and 377 are exemplary of dependent claims 125, 134, 201, 205-210, 315-317, 336, 337, 339, 340, 342, 343, 345, 346, 348-355, 360-369, 372, 375-277, 379, and 398. Dependent claims 360, 376, and 377 recite in pertinent part "making a building product," while dependent claim 361 recites *in toto* "[a] process as set forth in claim 253, further comprising the act of making a building product in response to the process set forth in claim 253." For its part, independent claim 253 recites the following limitations:

253. A process comprising the acts of:

generating first image information;

generating second image information;

generating spatial interpolated image information in response to the first image information and in response to the second image information;

generating temporal interpolated image information in response to the spatial interpolated image information; and

generating redundancy reduced image information in response to the temporal interpolated image information.

b. Support Determination

The appellant alleges that support for the exemplary claims can be found in two parts of his specification. (Reply Br. at 55.) The first part describes "[o]ne configuration of the system of the [appellant's] present invention. . . ." (Spec. at 16.) Specifically, the part merely explains that "[t]his configuration can be implemented as a general purpose . . . computer aided design workstation. . . ." (*Id.* at 17.) The second part comprises lines from a computer program entitled "LD.ASC." (Spec. at 547.) Specifically, lines 122 and 142 are nothing more than commands to print the directions, "SELECT IMAGE TO BE LOADED INTO IMAGE MEMORY," (*id.* at 548), and "HOUSE. . . ." (*Id.*) Line 151 merely inputs an "OPERATION NUMBER." (*Id.*)

Neither of the parts cited by the appellant mentions, let alone defines the meaning of, the claimed "building product." Furthermore, the examiner's finding that the specification's disclosure of static photographs "is completely unrelated to the claimed 'building product' . . .," (Examiner's Answer at 41), is uncontested.

In claim 361, moreover, the limitations "further comprising" and "in response to" evidence that the act of "making a building product" is an additional act in the process of independent claim 253. The product does not result from the process of the

independent claim; it results from some additional act of "making." Neither of the parts cited by the appellant describes a "building product" being made in response to the process set forth in claim 253. Because the appellant has not shown that the specification describes either the claimed "building product" or the claimed act of "making" the building product in response to the process set forth in claim 253, we find that the disclosure fails to reasonably convey to the artisan that, as of the filing date of his application, the appellant had possession of the claimed act of making a filter product set forth in claims 360, 361, 376, and 377 or the claimed act of making a filter product in response to the process set forth in claim 253.

Even if the appellant had shown support for claims 125, 134, 201, 205-210, 315-317, 336, 337, 339, 340, 342, 343, 345, 346, 348-355, 360-369, 372, 375-377, 379, and 398, these claims depend from independent claims that have been found to lack support *supra*. Therefore, we affirm the written description rejection of claims 125, 134, 201, 205-210, 315-317, 336, 337, 339, 340, 342, 343, 345, 346, 348-355, 360-369, 372, 375-377, 379, and 398.

B. ENABLEMENT REJECTION

We address the claims in the following order:

- non-product claims shown to lack enablement
- non-product claims not shown to lack enablement
- product claims corresponding to static photographs
- product claims not corresponding to static photographs.

1. Non-product Claims Shown to Lack Enablement

Rather than reiterate the positions of the examiner or the appellant *in toto*, we focus on the points of contention therebetween, which follow:

- generating extrapolated image information in response to first image information
- generating interlaced coefficient image information in response to extrapolated image information and interpolated image information.

a. Generating extrapolated image information in response to first image information

The appellant cites "pages 435-438" of his specification. (Appeal Br. at 8.) The examiner asserts that "without knowing the type of extrapolation to be used . . . , one of ordinary skill would not have known . . . how it was performed. . . ." (Examiner's Answer at 27.)

i. Claim Construction

Independent claim 115 recites in pertinent part the following limitations:

"generating extrapolated image information in response to **the first image information**. . . ." (Emphasis added.) Independent claims 118, 119, 122, 126, 129, 132, 135, 138, 151, 161, 162, 165, 171, 174, 180, 183, 189, 192, 198, 213, 215, 219, 224, 228, 232, 236, 240, 257, 259, 263, 267, 275, 287, 291, 299, 303, 393, 395, 396, 400, 406, 412, 417, 421, and 431 recite similar limitations. The part of the specification cited by the appellant discloses that the appellant's invention can "provide . . . extrapolation from a datapoint." (Spec. at 435.) Reading the aforementioned claims in view of the specification, the limitations require extrapolating from a single point of data.

ii. Enablement Determination

"[T]he PTO bears an initial burden of setting forth a reasonable explanation . . . why it believes that the scope of protection provided by that claim is not adequately enabled by the description of the invention provided in the specification of the application. . . ." *In re Wright*, 999 F.2d 1557, 1561-62, 27 USPQ2d 1510, 1513 (Fed. Cir. 1993) (citing *In re Marzocchi*, 439 F.2d 220, 223-24, 169 USPQ 367, 369-70 (CCPA 1971)). More specifically, "[t]o be enabling under §112, a patent must contain a

description that enables one skilled in the art to make and use the claimed invention." *Atlas Powder Co. v. E. I. Du Pont de Nemours & Co.*, 750 F.2d 1569, 1576, 224 USPQ 409, 413 (Fed. Cir. 1984) (citing *Raytheon Co. v. Roper Corp.*, 724 F.2d 951, 960, 220 USPQ 592, 599 (Fed. Cir. 1983)).

Here, the examiner's finding that "[t]he term 'extrapolate' . . . ha[d] a known meaning at the time of the invention," (Examiner's Answer at 24), viz., "'extrapolation' meant . . . a process of taking a set of data and creating additional data outside of the data set," (*id.*), is uncontested. In other words, one reasonably skilled in the art would have known that extrapolation was performed on plural points of data, i.e., a "data set." The aforementioned independent claims, however, recite extrapolation from a single point of data, e.g., the claimed "first image information." (*E.g.*, claim 115.) Because the claimed extrapolation differs radically from that known in the art, we are persuaded that one reasonably skilled in the art would have been unable to "generat[e] extrapolated image information in response to the first image information," without undue experimentation, as claimed.

b. Generating interlaced coefficient image information in response to extrapolated image information and interpolated image information

The appellant cites "pages 435-438" of his specification. (Appeal Br. at 8.) The examiner finds, "the terms 'extrapolation' and 'interpolation' . . . appear in the form of alternatives. . . ." (Examiner's Answer at 81.)

i. Claim Construction

Independent claim 115 recites in pertinent part the following limitations:
"generating coefficient image information related to variations between pixels in response to the extrapolated image information generated by the extrapolation processor **and** in response to the temporal interpolated image information generated by the temporal interpolation processor." (Emphasis added.) Independent claims 118, 198, 213, 228, and 431 recite similar limitations. Accordingly, the limitations require generating coefficient image information in response to **both** an extrapolation **and** an interpolation.

ii. Enablement Determination

The part of the specification cited by the appellant does not disclose that its coefficients are generated responsive to **both** an extrapolation **and** an interpolation as

claimed. To the contrary, the specification explains that its coefficients result from "an interpolation **or** [an] extrapolation," (Spec. at 435 (emphasis added)), i.e., either an interpolation or an extrapolation. Because the specification specifies that its coefficients result from either an interpolation or an extrapolation, we are persuaded that one reasonably skilled in the art would have been unable to "generat[e] interlaced coefficient image information related to variations between pixels in response to the interlaced extrapolated image information and in response to the interlaced temporal interpolated image information" as claimed. Therefore, we affirm the enablement rejection of claim 115 and of claims 116, 117, and 335, which depend therefrom; of claim 118 and of claims 124 and 370, which depend therefrom; of claim 119 and of claims 120 and 121, which depend therefrom; of claim 122 and of claim 123 and 125, which depend therefrom; of claim 126 and of claims 127 and 128, which depend therefrom; of claim 129 and of claims 130 and 131, which depend therefrom; of claim 132 and of claims 133, 134, and 372, which depend therefrom; of claim 135 and of claims 136, 137, and 373, which depend therefrom; of claim 138; of claim 151; of claim 161; of claim 162 and of claims 163, 164, and 375, which depend therefrom; of claim 165 and of claims 166, 167, and 376, which depend therefrom; of claim 171 and of claims 172 and 173, which depend therefrom; of claim 174 and of claims 175 and 176, which depend therefrom; of claim 180 and of claims 181, 182, and 377, which

depend therefrom; of claim 183 and of claims 184 and 185, which depend therefrom; of claim 189 and of claims 190, 191, and 372, which depend therefrom; of claim 192 and of claims 193 and 194, which depend therefrom; of claim 198 and of claims 199-212, 324, 336, 349, 362, and 389-391, which depend therefrom; of claim 213 and of claims 214, 337, 350, and 363, which depend therefrom; of claim 215 and of claims 216-218, 338, 351, and 364, which depend therefrom; of claim 219 and of claims 220-223, 339, 352, and 365, which depend therefrom; of claim 224 and of claims 225-227, 340, 353, and 366, which depend therefrom; of claim 228 and of claims 229-231, 325, 341, 354, 367, and 380-385, which depend therefrom; of claim 232 and of claims 233-235, 342, 355, and 368; of claim 236 and of claims 237-239, 343, 356, and 369, which depend therefrom; of claim 240 and of claims 241, 326, 344, 357, and 383, which depend therefrom; of claim 257 and of claim 258, which depends therefrom; of claim 259 and of claims 260-262, which depend therefrom; of claim 263 and of claims 264-266, which depend therefrom; of claim 267 and of claims 268-270, which depend therefrom; of claim 275 and of claims 276-278, which depend therefrom; of claim 287 and of claims 288-290, which depend therefrom; of claim 291 and of claims 292-294, which depend therefrom; of claim 299 and of claims 300-302, which depend therefrom; of claim 303 and of claims 304-306; of claim 393; of claim 395; of claim 396 and of claims 397-399, which depend therefrom; of claim 400 and of claims 401 and 402,

which depend therefrom; of claim 406 and of claims 407-409, which depend therefrom; of claim 412 and of claim 413, which depends therefrom; of claim 417 and of claims 418-420, which depend therefrom; of claim 421 and of claims 422-430, which depend therefrom; and of claim 431 and of claims 432-440, which depend therefrom.

2. Non-product Claims Not Shown to Lack Enablement

"For each rejection under 35 U.S.C. 112, first paragraph, the examiner's answer . . . shall explain how the first paragraph of 35 U.S.C. 112 is not complied with, including, as appropriate, how the specification and drawings . . . would not enable any person skilled in the art to make and use the subject matter defined by each of the rejected claims without undue experimentation. . . ." M.P.E.P. § 1208. Here, although the examiner includes claims 139-141, 145-147, 177-179, 195-197, 242-244, 245, 247-249, 251-253, 255, 256, 271, 273, 274, 279, 281-283, 285, 286, 295, 297, 298, 307, 309, 310, 392, 394, 410, and 414 in his statement of the enablement rejection, (Examiner's Answer at 44), his explanation of the rejection, (*id.* at 44-53), fails to address any of these claims. We will not resort to speculation as to the examiner's position. Therefore, we reverse the enablement rejection of these claims.

3. Product Claims Corresponding to Static Photographs

Observing that "127 of the pending claims⁹ recite limitations for making 'products' of one type or another," (Examiner's Answer at 50), the examiner finds that "with one exception, variations of the term 'product' (e.g., 'products') [are] used in the specification only in a mathematical sense (such as for multiplication or a sum-of-products)." (*Id.* at 40-41.) The appellant argues, "The disclosure has written description of 'product' claim limitations in combination with other claim limitations." (Reply Br. at 52.)

a. Claim Construction

Claims 246, 250, 254, 272, 280, 284, 296, 308, 371, 373, 411, and 415 recite in pertinent part "making a product." Claims 318-320 recite in pertinent part "making a design product" and "making a second product." Claims 321-323 recite in pertinent part "making a display product" and "making a second product." Claim 347 recites in pertinent part "making an entertainment product." Claims 358 and 359 recite in pertinent part "making a communication product." Claim 386 recites in pertinent part "making a first product." Claim 387 recites in pertinent part "making a second product." Claim 388 recites in pertinent part "making a third product." Claim 416 recites in

⁹The examiner should have enumerated all of the 127 claims.

pertinent part "making a first product," "making a second product," and "making a third product."

b. Enablement Determination

In addressing the written description rejection, *supra*, we found that the claimed "making a product," the claimed "making a design product," the claimed "making a second product," the claimed "making a display product," the claimed "making an entertainment product," the claimed "making a communication product," the claimed "making a first product," and the claimed "making a third product" each refers to the disclosed making of static photographs. We are not persuaded that the specification would not have enabled one skilled in the art to make static photographs without undue experimentation. Therefore, we reverse the enablement rejection of claims 246, 250, 254, 272, 280, 284, 296, 308, 318-323, 347, 358, 359, 371, 386-388, 411, 415, and 416.

4. Product Claims Not Corresponding to Static Photographs

The examiner asserts, "The specification provides no guidance as to how these products are made or what these products are intended to be. Without any guidance from the originally filed specification, one of ordinary skill in the art would be burdened

with undue experimentation or delay in trying to make and use the claimed invention." (Examiner's Answer at 52.) The appellant argues, "The experimental system (e.g., pages 240-371) discloses the details of the system products." (Appeal Br. at 51.)

In addressing the written description rejection, *supra*, we found no showing that the specification describes either the meaning of the claimed products or the act of making the products. Without knowing the identity of the claimed products, we are not persuaded that the specification would have enabled one skilled in the art to make and use the claimed products without undue experimentation. Therefore, we affirm the enablement rejection of claims 125, 134, 201, 205-210, 315-317, 336, 337, 339, 340, 342, 343, 345, 346, 348-355, 360-369, 372, 375-379, and 398.¹⁰

C. OBVIOUSNESS REJECTION

We address the following points of contention between the examiner and the appellant:

- analogousness of Netravali
- analogousness of Marsh

¹⁰In addition, we affirmed the enablement rejection of many of these claims as depending from claims whose enablement rejection we had also affirmed.

- motivation to add extrapolation to Netravali
- motivation to add spatial domain interpolation or temporal interpolation or both to Netravali.

1. Analogousness of Netravali

The examiner finds, "Since Netravali is directed to a 'data compression system' . . . one of ordinary skill in the art would have been motivated to use Netravali. . . ."

(Examiner's Answer at 137-38.) The appellant argues, "Netravali shows a data compression television system while the instant claimed invention teaches an [sic] temporal interpolative [sic] or extrapolative [sic] system." (Reply Br. at 122-23.)

"Whether a reference in the prior art is 'analogous' is a fact question." *In re Clay*, 966 F.2d 656, 658, 23 USPQ2d 1058, 1060 (Fed. Cir. 1992) (citing *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561, 1568 n.9, 1 USPQ2d 1593, 1597 n.9 (Fed. Cir. 1987)). Two criteria have evolved for answering the question: "(1) whether the art is from the same field of endeavor, regardless of the problem addressed, and (2) if the reference is not within the field of the inventor's endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved." *Id.* at 658-59, 23 USPQ2d at 1060 (citing *In re Deminski*, 796 F.2d 436, 442, 230 USPQ 313, 315 (Fed. Cir. 1986); *In re Wood*, 599 F.2d 1032, 1036, 202 USPQ 171, 174

(CCPA 1979)). "A reference is reasonably pertinent if, even though it may be in a different field from that of the inventor's endeavor, it is one which, because of the matter with which it deals, logically would have commended itself to an inventor's attention in considering his problem." *Id.* at 659, 23 USPQ2d at 1061. "To qualify as analogous art under the second criterion, . . . we do not believe that a prior art reference need be reasonably pertinent to each and every problem with which an inventor is involved; reasonable pertinence to a single such problem suffices." *Ex parte Gaechter*, 65 USPQ2d 1690, 1692 (Bd.Pat.App & Int. 2002).

Here, regarding the second criterion, one problem faced by the appellant is that of data compression. The appellant emphasizes that his "disclosure has a whole section . . . entitled 'Database Data Compression' (Spec. at 435-438). Terminology relating to compression and decompression are recited more than twenty times in this section." (Reply Br. at 25-26.) For example, the section discloses that "[t]he amount of storage in [a] database for a particular image can be reduced by storing compressed image data." (Spec. at 435.)

Netravali also faces the problem of data compression. Using the reference's invention, "[v]ideo signals are encoded (FIG. 5) using motion compensated prediction

which operates on a transform domain representation of the signal." Abs., ll. 1-3. In doing so, explains Netravali, "it is desirable that the encoded signal faithfully reproduce the original input, when decoded, and that **storage requirements** (as opposed to processing circuits) **be kept to a minimum.**" Col. 1, ll. 64-68 (emphases added). In other words, the reference "achieve[s] compression," *id.* at l. 33, of data. Because the respective inventions of the appellant and Netravali both relate to the problem of data compression, we find that the reference is analogous art.

2. Analogousness of Marsh

The examiner finds that Marsh "generat[es] . . . an image. . . ." (Examiner's Answer at 65.) The appellant argues, "Marsh is non-analogous with the instant claimed invention — Marsh shows a graphics (polygon) flight simulator system while the instant claimed invention is directed to an [sic] temporal interpolative [sic] or extrapolative [sic] system." (Reply Br. at 122.)

Regarding the first criterion for analogous art, the appellant states that "[t]he field of the present invention is display and machine vision systems and, in particular, image processing systems." (Spec. at 3.) Similarly, Marsh "relates to an imaging system for displaying objects. . . ." Col. 1, ll. 7-8.

The appellant also discloses that his invention includes a flight simulation application. (Spec. at 466.) Similarly, Marsh's invention concerns "a flight simulation system. . . ." Col. 2, l. 22. Because the respective inventions of the appellant and the reference are both from the field of display systems, imaging systems, or flight simulators, we find that Marsh is analogous art.

3. Motivation to Add Extrapolation to Netravali

The examiner admits that "extrapolation is not explicitly disclosed in Netravali," (Examiner's Answer at 54), but takes official notice "that extrapolation was well known and conventional." (*Id.*) He concludes that "[i]t would have been obvious to one of ordinary skill in the art to utilize extrapolated image information because this would provide enhanced image information for display (since both [sic] Netravali displays images)." (*Id.* at 54-55.) Admitting that "almost all electronics technical words are known," (Reply Br. at 142), the appellant argues that the examiner "has not established that Netravali [sic] and Marsh have any use for such features, nor how these features would work or be incorporated into either Netravali [sic] or Marsh. . . ." (*Id.*)

a. Claim Construction

Claims 115-138, 151, 161-167, 171-185, 189-194, 198-241, 257-270, 275-282, 287-294, 299-306, 324-326, 335-344, 349-357, 362-370, 372, 373, 375-377, 379-385, 389-393, 395-402, 406-409, 412, 413, 417-421, 425-431, and 435-440 require extrapolation.

B. Obviousness Determination

"Having determined what subject matter is being claimed, the next inquiry is whether the subject matter would have been obvious." *Ex Parte Massingill*, No. 2003-0506, 2004 WL 1646421, at *3 (Bd.Pat.App & Int. 2004). "The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification." *In re Fritch*, 972 F.2d 1260, 1266, 23 USPQ2d 1780, 178-84 (Fed. Cir. 1992) (citing *In re Gordon*, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984)). "[T]he factual inquiry whether to combine references must be thorough and searching." *McGinley v. Franklin Sports, Inc.*, 262 F.3d 1339, 1351-52, 60 USPQ2d 1001, 1008 (Fed. Cir. 2001). This factual question cannot "be resolved on subjective belief and unknown authority," *In re Lee*, 277 F.3d 1338, 1343-44, 61 USPQ2d 1430, 1434 (Fed. Cir. 2002); "[i]t must be based on objective evidence of record." *Id.* at 1343, 61

USPQ2d at 1434. "Although couched in terms of combining prior art references, the same requirement applies in the context of modifying such a reference." *Ex parte Barbur*, No. 1998-3339, 2002 WL 1801357, at *3 (Bd.Pat.App. & Int. 2001). Namely, the factual inquiry whether to modify references must be thorough and searching. The inquiry cannot be resolved on subjective belief and unknown authority; it must be based on objective evidence of record.

Here, the examiner has shown no objective evidence that using extrapolated image information in Netravali's video encoding "would provide enhanced image information for display. . . ." (Examiner's Answer at 55.) We cannot rely only on the examiner's subjective belief or unknown authority thereto. Nor has he explained what sort of enhancement he believes would result. Furthermore, we are uncertain how the examiner proposes to use the extrapolated image information in Netravali.

The examiner does not allege, let alone show, that the addition of Marsh cures the aforementioned deficiency. Therefore, we reverse the obviousness rejection of claims 115-138, 151, 161-167, 171-185, 189-194, 198-241, 257-270, 275-282, 287-294, 299-306, 324-326, 335-344, 349-357, 362-370, 372, 373, 375-377, 379-385, 389-393, 395-402, 406-409, 412, 413, 417-421, 425-431, and 435-440.

*4. Motivation to Add Spatial Domain Interpolation or Temporal Interpolation
or Both to Netravali*

The examiner admits that Netravali "is silent with regard to it[is interpolation] being temporal or spatial," (Examiner's Answer at 55), but takes official notice "that spatial domain and temporal interpolation was well known and conventional" (*Id.*) He concludes that "it would have been obvious to one of ordinary skill in the art to utilize spatial domain and temporal interpolation processors in Netravali's system," (*id.*), because "Taylor's teaching provides the advantage of greater flexibility while maintaining picture quality (Taylor, column 1, lines 19-20)." (*Id.*) Admitting that "almost all electronics technical words are known," (Reply Br. at 142), the appellant argues that the examiner "has not established that Netravali [sic] and Marsh have any use for such features, nor how these features would work or be incorporated into either Netravali [sic] or Marsh. . . ." (*Id.*)

a. Claim Construction

Claims 139-141, 145-147, 195-197, 242-256, 271-274, 283-286, 295-298, 307-310, 315-323, 345-348, 358-361, 371, 386-388, 394, 410-411, and 414-416 require spatial domain interpolation or temporal interpolation or both.

B. Obviousness Determination

"Where a reference is relied on to support a rejection, whether or not in a 'minor capacity,' there would appear to be no excuse for not positively including the reference in the statement of rejection." *In re Hoch*, 428 F.2d 1341, 1342 n.3, 166 USPQ 406, 407 n.3 (CCPA 1970). Here, although the examiner relies on Taylor for a motivation to use "spatial domain and temporal interpolation processors in Netravali's system," (Examiner's Answer at 55), he fails to include the reference in the statement of the obviousness rejection. (*Id.* at 53.) Accordingly, although Taylor constitutes "evidence to support the examiner's taking of Official Notice," (*id.*), "that spatial domain and temporal interpolation was well known and conventional," (*id.*), we cannot consider the reference for a motivation to modify Netravali (or any other purpose) in deciding this appeal.

The examiner does not allege, let alone show, that the addition of Marsh cures the aforementioned deficiency. Therefore, we reverse the obviousness rejection of claims 139-141, 145-147, 195-197, 242-256, 271-274, 283-286, 295-298, 307-310, 315-323, 345-348, 358-361, 371, 386-388, 394, 410-411, and 414-416.

III. CONCLUSION

In summary, the rejection of claims 115-128, 132-141, 145-147, 151, 171-179, 189-191, 198-241, 244-258, 263-278, 283-290, 295-298, 307-310, 315-326, 335-357, 359-370, 372, 373, 375-377, 379-391, 393, 394, 396-402, 406-420, and 431-440 under § 112, ¶ 1, as lacking a written description rejection is affirmed. In contrast, the rejection of claims 129-131, 161-167, 180-185, 192-197, 242, 243, 259-262, 279-282, 291-294, 299-306, 358, 371, 392, 395, and 421-430 under § 112, ¶ 1, as lacking a written description rejection is reversed.

The rejection of claims 115-138, 151, 161-167, 171-176, 180-185, 189-194, 198-241, 257-270, 275-278, 287-294, 299-306, 315-317, 324-326, 335-346, 348-357, 360-373, 375-385, 389-391, 393, 395-402, 406-409, 412, 413, and 417-440 under § 112, ¶ 1, as non-enabled is also affirmed. In contrast, the rejection of claims 139-141, 145-147, 177-179, 195-197, 242-256, 271-274, 279-286, 295-298, 307-310, 318-323, 347, 358, 359, 371, 386-388, 392, 394, 410, 411, and 414-416 under § 112, ¶ 1, as non-enabled is reversed.

The rejection of claims 115-141, 145-147, 151, 161-167, 171-185, 189-310, 315-326, 335-373, 375-377, 379-402, 406-421, 425-431, and 435-440 under § 103(a) is also reversed.

"Any arguments or authorities not included in the brief will be refused consideration by the Board of Patent Appeals and Interferences. . . ." 37 C.F.R. § 1.192(a). Accordingly, our affirmance is based only on the arguments made in the briefs. Any arguments or authorities omitted therefrom are neither before us nor at issue but are waived. *Cf. In re Watts*, 354 F.3d 1362, 1367, 69 USPQ2d 1453, 1457 (Fed. Cir. 2004) ("[I]t is important that the applicant challenging a decision not be permitted to raise arguments on appeal that were not presented to the Board.")

No time for taking any action connected with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

IV. NOTICE REGARDING ANY REQUEST FOR REHEARING

"A party cannot wait until after the Board has rendered an adverse decision and then present new arguments in a request for reconsideration." *Cooper v. Goldfarb*, 154 F.3d 1321, 1331, 47 USPQ2d 1896, 1904 (Fed. Cir. 1998) (citing *Moller v. Harding*,

214 USPQ 730, 731 (Bd. Pat. App. & Int. 1982), *aff'd*, 714 F.2d 160 (Fed. Cir. 1983) (table)). Furthermore, an argument advanced in a petition for reconsideration but not previously advanced in a brief or reply brief "is not properly before us." *Ex parte Hindersinn*, 177 USPQ 78, 80 (Bd. Pat. App. & Int. 1971).

Accordingly, any request for rehearing of this decision under 37 C.F.R. § 41.79 is limited to points of fact or law or both that the appellant believes were overlooked or misapprehended in rendering the instant decision. In any such request, moreover, the appellant must state with particularity each point of law or fact that he believes was overlooked or misapprehended, must argue in support of each point, and must refer with particularity to where the argument was made originally in the appeal brief or reply brief. Failure to point to the page and line number of where the argument was originally made in the brief or reply brief will be considered evidence of a new argument. Any new argument that was not presented in the appeal brief or reply brief will be refused consideration.

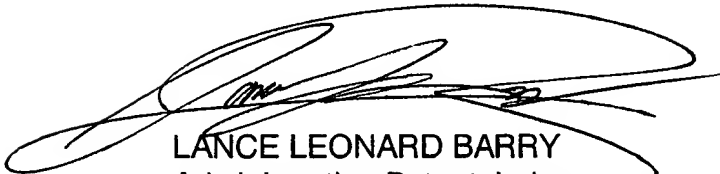
AFFIRMED



LEE E. BARRETT
Administrative Patent Judge



ANITA PELLMAN GROSS
Administrative Patent Judge



LANCE LEONARD BARRY
Administrative Patent Judge

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) BOARD OF PATENT
) APPEALS
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Appeal No. 2005-1005
Application No. 08/458,104

Page 70

GILBERT P HYATT
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**Ex parte Hyatt, Decision on Appeal No. 2003-0472,
in patent application Serial No. 08/456,901
(PTO Bd. App. Aug. 25, 2004) (unpublished PTO decision)**

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 52

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte GILBERT P. HYATT

Appeal No. 2003-0472
Application 08/456,901¹

HEARD: July 14, 2004

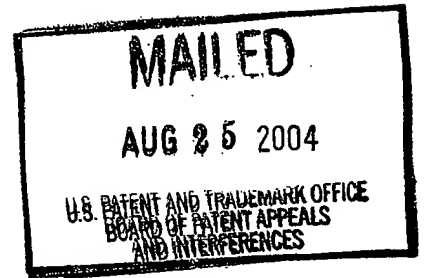
Before HAIRSTON, BARRETT, and GROSS, Administrative Patent Judges.
BARRETT, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134(a) from the final rejection of claims 117-315 and 457-614, all of the pending claims. Claims 1-116 and 316-456 have been canceled.

We affirm-in-part.

¹ Application for patent filed June 1, 1995, entitled (as amended) "Improved Image Processing Architecture," which claims the benefit of the priority dates under 35 U.S.C. § 120 of numerous applications, the earliest of which is Application 06/504,691, filed June 15, 1983, now abandoned (amendment of Paper No. 22, May 27, 1997). No specific determination has been made as to whether appellant is entitled to the filing date of this earliest application for the claimed subject matter.



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BACKGROUND

Appellant describes the claimed invention as "directed to a novel data compression/decompression invention having e.g., overlaying, combining, occulting, or compositing with object, background, foreground, 3D-perspective, translating, rotating, warping, cropped, video, or graphics information" (brief, p. 8).

Claim 180 is reproduced below.

180. A system comprising:

a graphics image circuit generating graphics image information;

an input circuit generating data compressed background image information, generating first data compressed object image information, generating second data compressed object image information, and generating data compressed video image information;

a data decompression circuit coupled to the input circuit and generating data decompressed background image information in response to the data compressed background image information generated by the input circuit, generating first data decompressed object image information in response to the first data compressed object image information generated by the input circuit, generating second data decompressed object image information in response to the second data compressed object image information generated by the input circuit, and generating data decompressed video image information in response to the data compressed video image information generated by the input circuit;

a translating circuit coupled to the data decompression circuit and generating first translated object image information in response to the first data decompressed object image information generated by the data decompression circuit, generating second translated object image information in response to the second data decompressed object image information generated by the data decompression circuit, and generating translated video image information in response to the data decompressed video image information generated by the data decompression circuit; and

an overlay circuit coupled to the graphics image circuit, coupled to the translating circuit, and coupled to the data decompression circuit, the overlay circuit generating overlaid image information by overlaying in response to the graphics image information generated by the graphics image circuit, in response to the first translated object image information generated by the translating circuit, in response to the second translated object image information generated by the translating circuit, in response to the data decompressed background image information generated by the data decompression circuit, and in response to the translated video image information generated by the translating circuit.

REFERENCES

The examiner relies on the following references:

| | | |
|------------------------------|-----------|-------------------|
| Marsh | 4,179,824 | December 25, 1979 |
| Netravali et al. (Netravali) | 4,245,248 | January 13, 1981 |

The examiner also cites the following reference in support of a statement of Official Notice:

| | | |
|--------|-----------|-----------------|
| Merola | 4,293,920 | October 6, 1981 |
|--------|-----------|-----------------|

THE REJECTIONS

For reference purposes, pages of the examiner's answer (Paper No. 41) are referred to as "EA__"; pages of the brief (Paper No. 40) are referred to as "Br__"; and pages of the reply brief (Paper No. 43) are referred to as "RBr__".

Claims 117-315 and 457-614, all of the claims pending in the case, stand rejected under 35 U.S.C. § 112, first paragraph, as based on a lack of written description (EA7 § 10.1). Dependent claims 205, 209, 213, 217, 221, 225, 229, 233, 237, 241, 245,

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249, 253, 257, 261, 265, 269, 273, 277, 281, 285, 289, 293, 297, 301, 305, 309, 313, 457-460, 462-469, 471-490, 492-503, 505-536, 538-576, 578-595, and 597-599 also stand rejected based on a lack of written description for the "making a product" limitations (EA18 § 10.1.2).

Claims 117-315 and 457-614, all the claims in the case, stand rejected under 35 U.S.C. § 112, first paragraph, based on a lack of enablement (EA24 § 10.2). Dependent claims 205, 209, 213, 217, 221, 225, 229, 233, 237, 241, 245, 249, 253, 257, 261, 265, 269, 273, 277, 281, 285, 289, 293, 297, 301, 305, 309, 313, 457-460, 462-469, 471-490, 492-503, 505-536, 538-576, 578-595, and 597-599 also stand rejected based on a lack of enablement for the "making a product" limitations (EA30 § 10.2.2).

Claims 117-315, 457-607, and 610-614 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Netravali and Marsh and various findings of Official Notice (EA32 § 10.3). The rejection relies on Merola to support the finding of Official Notice that 64-sample blocks were well known and conventional (EA37-38). Dependent claims 205, 209, 213, 217, 221, 225, 229, 233, 237, 241, 245, 249, 253, 257, 261, 265, 269, 273, 277, 281, 285, 289, 293, 297, 301, 305, 309, 313, 457-460, 462-469, 471-490, 492-503, 505-536, 538-576, 578-595, and 597-599 (the "making a product" claims) stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Netravali and Marsh and

Official Notice that products were well known and conventional
(EA44-46 § 10.3).

OPINION

Written description

Legal standards

The written description rejection under 35 U.S.C. § 112, first paragraph, is used to reject when a claim is amended or a new claim added to recite elements thought to be without support in the original disclosure. See In re Rasmussen, 650 F.2d 1212, 1214-15, 211 USPQ 323, 326 (CCPA 1981). The test for written description is summarized in Purdue Pharma L.P. v. Faulding Inc., 230 F.3d 1320, 1323, 56 USPQ2d 1481, 1483 (Fed. Cir. 2000):

In order to satisfy the written description requirement, the disclosure as originally filed does not have to provide in haec verba support for the claimed subject matter at issue. See Fujikawa v. Wattanasin, 93 F.3d 1559, 1570, 39 USPQ2d 1895, 1904 (Fed. Cir. 1996). Nonetheless, the disclosure "must ... convey with reasonable clarity to those skilled in the art that ... [the inventor] was in possession of the invention." Vas-Cath Inc. v. Mahurkar, 935 F.2d 1555, 1563-64, 19 USPQ2d 1111, 1117 (Fed. Cir. 1991). Put another way, one skilled in the art, reading the original disclosure, must "immediately discern the limitation at issue" in the claims. Waldemar Link GmbH & Co. v. Osteonics Corp., 32 F.3d 556, 558, 31 USPQ2d 1855, 1857 (Fed. Cir. 1994). That inquiry is a factual one and must be assessed on a case-by-case basis. See Vas-Cath, 935 F.2d at 1561, 19 USPQ2d at 1116 ("Precisely how close the original description must come to comply with the description requirement of § 112 must be determined on a case-by-case basis.").

Details that would be known by one skilled in the art need not be included in a patent specification. See Hyatt v. Boone, 146 F.3d 1348, 1353, 47 USPQ2d 1128, 1131 (Fed. Cir. 1998). However, when an explicit limitation in a claim is not present in the written description, the burden is on the applicant to show that a person of ordinary skill in the art would have understood that the description necessarily includes that limitation. Cf. id. at 1354-55, 47 USPQ2d at 1132 ("Thus, the written description must include all of the limitations of the interference count, or the applicant must show that any absent text is necessarily comprehended in the description provided and would have been so understood at the time the patent application was filed." (Emphasis added.)). "It is 'not a question of whether one skilled in the art might be able to construct the patentee's device from the teachings of the disclosure.... Rather, it is a question whether the disclosure necessarily discloses that particular device." Id. at 1353-54, 47 USPQ2d at 1131 (citing Martin v. Mayer, 823 F.2d 500, 505, 3 USPQ2d 1333, 1337 (Fed. Cir. 1987)). See also Lockwood v. American Airlines Inc., 107 F.3d 1565, 1572, 41 USPQ2d 1961, 1968 (Fed. Cir. 1997) ("One shows that one is 'in possession' of the invention by describing the invention, with all of its claimed limitations, not that which makes it obvious.").

The USPTO has the burden of proof under the preponderance of the evidence standard. The burden regarding the written description requirement is described in In re Alton, 76 F.3d 1168, 1175, 37 USPQ2d 1578, 1583 (Fed. Cir. 1996):

Insofar as the written description requirement is concerned, that burden is discharged by "presenting evidence or reasons why persons skilled in the art would not recognize in the disclosure a description of the invention defined by the claims." Wertheim, 541 F.2d at 263, 191 USPQ at 97. Thus, the burden placed on the examiner varies, depending upon what the applicant claims. If the applicant claims embodiments of the invention that are completely outside the scope of the specification, then the examiner or Board need only establish this fact to make out a prima facie case. Id. at 263-64, 191 USPQ at 97. If, on the other hand, the specification contains a description of the claimed invention, albeit not in ipso verbis (in the identical words), then the examiner or Board, in order to meet the burden of proof, must provide reasons why one of ordinary skill in the art would not consider the description sufficient. Id. at 264, 191 USPQ at 98. Once the examiner or Board carries the burden of making out a prima facie case of unpatentability, "the burden of coming forward with evidence or argument shifts to the applicant." Oetiker, 977 F.2d at 1445, 24 USPQ2d at 1444.

When an applicant amends the claims or adds new claims, the applicant is supposed to point out in the remarks how the original disclosure supports the amendment, after which it is the examiner's burden to explain why there is a lack of written description. See MPEP 2163.04(b):

If applicant amends the claims and points out where and/or how the originally filed disclosure supports the amendment(s), and the examiner finds that the disclosure does not reasonably convey that the inventor had possession of the subject matter of the amendment at the time of the filing of the application, the examiner has the initial burden of presenting evidence or reasoning to explain why persons skilled in the art would not recognize in the

disclosure a description of the invention defined by the claims. Accordingly, the examiner should identify what portion(s) of the amendment lack support in the originally filed disclosure, and should fully explain the basis for the examiner's finding. The examiner also should comment on the substance of applicant's remarks. Any affidavits attesting to what one of ordinary skill in the art would consider disclosed by the application as originally filed must be thoroughly analyzed and discussed in the Office action.

The burden of establishing a prima facie case should consider that it is extremely difficult to prove that there is no written description support for claim limitations (i.e., to prove a negative), especially where, as here, the disclosure includes 576 pages of specification and 78 drawing figures, whereas it is trivial for appellant, who drafted both the specification and claims, to specifically point out support for the elements, steps, and interconnections recited in the claims.

Written description is a question of fact. Vas-Cath Inc. v. Mahurkar, 935 F.2d 1555, 1563, 19 USPQ2d 1111, 1116 (Fed. Cir. 1991). The U.S. Court of Appeals for the Federal Circuit reviews the Board's factual findings for substantial evidence. In re Gartside, 203 F.3d 1305, 1315, 53 USPQ2d 1769, 1775 (Fed. Cir. 2000). Substantial evidence "means such relevant evidence as a reasonable mind might accept as adequate to support a conclusion." Id. at 1312, 53 USPQ2d at 1772 (quoting Consolidated Edison Co. v. NLRB, 305 U.S. 197, 229-30 (1938)).

The disclosed invention

The claimed invention deals with computer image processing that involves overlaying object images against a background image. The technique is the digital equivalent of the old cartoon animation technique of forming a composite image by overlaying one or more images, each painted on a clear sheet of celluloid (cel), over a background image. The overlays could be moved relative to the background and to themselves from frame to frame to give the illusion of motion. Images are stored in a digital computer system memory as bitmaps, which can be thought of as a two-dimensional matrix of discrete intensity/color picture element (pixel) values (stored as bits) corresponding to the pixels on the screen representing the image. Each bitmap is an "image plane" or layer. The image planes can be overlaid for display using a priority scheme to determine which pixel in which bitmap is closer to the viewer. A well known example is overlapping windows on computers where windows are displayed against a background. Multiple windows can be overlaid so that they overlap and only a portion of the underlying windows are visible. See Rob Pike, Graphics in Overlapping Bitmap Layers, Computer Graphics, Vol. 17, No. 3, July 1983, reprinted from acm Trans. on Graphics, April 1983, Vol. 2, No. 2. (copy attached). It was also known that graphic symbol images, such as cursors and mouse pointers, could be overlaid on top of the image.

The background images in the invention can be, for example, images of a terrain (spec. at 386) or a map (spec. at 444). "Overlays can include combinations of processed images and graphic polygons." (Spec. at 386.) "Graphic overlays can be adapted for different applications. Cursors, crosshairs, sights, and other such graphic symbols can be used to identify selected portions of images. Alphanumerics can be used for annotating images." (Id.) "Overlays can be dynamically moving video images, such as real time video images from a video camera or video disk, and need not be limited to static overlays, such as from a database memory, that are dynamically manipulated." (Spec. at 402.) "Image overlays and graphic overlays can be mixed together" (Spec. at 386.) "[T]extured overlays can be provided." (Spec. at 388.) Both the graphic overlays and the image overlays can be independently processed for geometric operations including rotation, translation, scaling, 3D-perspective, cropping to irregular features, and warping (spec. at 388-389). Although "textured overlays" is not defined, it appears to refer to an image that is not just a graphic, e.g., an image of an object like a tree. Thus, the specification discloses overlaying background images, video images, textured images, and graphic images.

Overlaying can be done in various ways (spec. at 386):

Images can be overlayed in different planes of the same image processor; where occulting is selectable, such [as] in accordance with occulting priorities assigned to each plane, and motion therebetween is fixed. Images can be overlayed in different planes of different image processors; where occulting is selectable, such [as] in accordance with occulting priorities assigned to each plane, and motion therebetween is controllable, such as in accordance with independent image processors controlling different images.

"Planes" refer to image planes at different apparent distances from the viewer; thus, the background plane is furthest from the viewer. "Occulting" refers to concealing of an image or part of an image in one plane by overlaying it with an image or part of an image in a closer plane; i.e., images in the foreground hide images that are farther away. An example of occulting or overlaying multiple "cropped" objects on a background is as follows (spec. at 388):

Textured overlays can be cropped to irregular external and internal features; i.e., a tree has an external outline defined by the external leaf and branch outline and has internal spaces between leaves and branches. Textured overlaying can be performed to pixel resolution and pixel detail based upon occulting priorities. Therefore, a tree image can be oriented, positioned, scaled, warped and overlayed on a background image; occulting the background image, occulting portions of more remote objects, and being occulted by portions of nearer objects. Moving occulted features can be seen between the cropped portions of occulting overlays; i.e., a partially occulted tank image can be seen between the leaves of an occulting tree image as it moves behind the tree image and can be seen as it moves past the external outline of the tree image.

This tank example describes a background image and several objects, such as trees and a tank. The aircraft overlay, spec.

at 403, and the helicopter training simulator application, spec. at 471-472, are other examples of occulting and overlaying multiple objects. "For example, the background image can have textured mountains, hills, waterways, buildings, and meadows. A group of textured images; such as trees, buildings, and ground vehicles; can be overlayed on the background with occulting between images." (Spec. at 472.) "Cropping" identifies the pixels that are part of the image in contrast to those that are not part of the image, such as by using flags or using a known background color that identifies the cropped portion of the overlay (spec. at 393-396 & 402). The cropped image can be compressed, expanded, rotated, and translated (spec. at 400).

The "3D-perspective" is illustrated in the helicopter example (spec. at 471-472):

The expansion capability discussed herein facilitates approaching an overlay object, such as a tree, and having the object expand in size as it is approached to simulate 3D-perspective. For example, a tree overlay placed over the background image as a very small overlay image can then be expanded to fill the viewport and to expand beyond filling the viewport as the helicopter approaches the tree and hides behind the tree.

That is, the image can be "scaled" to give the appearance of moving toward or away from the viewer. The "3D-perspective" is also used for aircraft simulation (spec. at 446-447)"

3D-perspective provides range-related compression consistent with 3D-perspective. Therefore, as the aircraft banks, the image also 'banks'; showing terrain off to the side of the aircraft towards the horizon. This side-looking image is

compressed as a function of the range toward a vanishing point that is beyond the horizon.

See also spec. at 41 ("Spatial compression can be implemented as a function of range to provide a 3D distance perspective. Viewport 131M can be panned over image memory 131D as a function of tilt or aircraft bank angle in conjunction with range-related spatial compression to suitably compressed [sic] an image as function of range."); spec. at 90 ("3D-perspective and warping can be implemented by varying the slope or step size across the window. Setting the step size to vary on a scanline-by-scanline basis from the top of the image to the bottom of the image provides 3D-perspective caused by rotation of the image about the X-axis to tilt the top of the window backward into the third dimension."). Thus, the specification discloses generating three dimensional perspective object image information.

The specification discloses storing images in compressed form and decompressing it to restore the image (spec. at 409): "Images can be stored in the database in compressed or in non-compressed form. Storage in compressed form reduces the memory requirements and involves de-compression to restore the image." See also spec. at 435 ("The amount of storage in the database for a particular image can be reduced by storing compressed image data. The system can be implemented to decompress the image for image processing and display."); spec. at 437 ("Compressed information can be decompressed prior to

loading into image memory so that images in image memory are in decompressed form.... Geometric processing can be performed on decompressed information stored in image memory; where decompression can be performed prior to geometric processing, such as before loading into image memory or after accessing from image memory."). Thus, the specification discloses storing compressed images and decompressing the images.

The specification adequately describes the hardware for performing the described functions. The image processing system is shown generally in Fig. 1A (spec. at 17):

The block diagram shown in Fig 1A illustrates the modular expandability of the system of the present invention, shown in greater detail in Figs 1B to 1G. A plurality of geometric modules 110A to 110B can be configured in parallel channel form, such as for multiple overlays. The geometrically processed images can be combined with a geometric multiplexer/demultiplexer/combiner 110D. Multiplexing selects a particular geometric processed image channel for subsequent processing. Processing includes overlaying, adding, subtracting, and otherwise selecting and combining of images. For example, many channels of geometrically processed images 110C can be overlayed with occulting priorities.

"A supervisory processor 110R provides supervisory operations For example, geometric modules 110C can be controlled for different types of geometric processing with different geometric parameters" (Spec. at 19.) Fig. 1A shows a plurality of input sources of images 110J (spec. at 18), which is shown in more detail in Fig. 1F. "A plurality of sources 112A to 112F can be provided for generating image information together with input

and interface circuitry for converting the input source images into a form compatible with the geometric modules." (Spec. at 21.) Note that the input sources are described as "generating image information" by inputting the information, which is consistent with the claim terminology. Sources include digital image sources 112A, 112B; composite video image sources 112C, 112D; and RGB video image sources 112E, 112F. A separate "graphics generator" is shown in Fig. 1I, but not described in connection with that figure.

The functions of rotation, translation, compression, decompression or expansion, 3D-perspective, etc. are performed by the geometric processor (geometric modules 110A, 110B in Fig. 1A), which is also called an image processor. See spec. at 1 ("A geometric processor is provided for rotation, translation, expansion, compression, warping, 3D-perspective, vectors, windows, and other features."); spec. at 34 ("The image in image memory 111C can be processed under control of geometric processor 111D; such as for rotation, translation, expansion, compression, 3D-perspective, warping, windowing, and overlaying."); spec. at 40-41 ("Image processor 131E provides real time rotation, translation, spatial compression, anti-aliasing, and other image processing operations to achieve a dynamic image derived from the static image in image memory 131D under control of the driving functions generated by supervisory

processor 131F."). The way the geometric processor works is also described (spec. at 77): "In one configuration, the geometric processor discussed herein may be characterized as an address generator that transforms addresses of pixels from a source memory into addresses of pixels for a destination memory to facilitate transferring of pixels from the source memory into the destination memory with a related translation, rotation, and compression characteristic."

Analysis

For simplicity, we do not discuss the conflicting positions of the examiner and appellant, but focus on the disclosure.

Claim 180

180. A system comprising:

The system is generally shown and explained in connection with Figs. 1A-1D and 1F-10.

a graphics image circuit generating graphics image information;

Graphics image information includes graphic symbols and alphanumerics. "Graphic overlays can be adapted for different applications. Cursors, crosshairs, sights, and other such graphic symbols can be used to identify selected portions of images. Alphanumerics can be used for annotating images."

(Spec. at 386.) A graphics generator 130J is shown in Fig. 1I (but not described in connection with that figure).

an input circuit generating data compressed background image information, generating first data compressed object image information, generating second data compressed object image information, and generating data compressed video image information;

a data decompression circuit coupled to the input circuit and generating data decompressed background image information in response to the data compressed background image information generated by the input circuit, generating first data decompressed object image information in response to the first data compressed object image information generated by the input circuit, generating second data decompressed object image information in response to the second data compressed object image information generated by the input circuit, and generating data decompressed video image information in response to the data compressed video image information generated by the input circuit;

The specification describes several input channels in Fig. 1A and Fig. 1F. Figure 1F shows digital image sources, video image sources, and image sources from other geometric modules. The input circuit could be one or a combination of several of these input channels.

The specification discloses storing images in compressed form and decompressing to restore the image (spec. at 409):
"Images can be stored in the database in compressed or in non-compressed form. Storage in compressed form reduces the memory requirements and involves de-compression to restore the image." See also spec. at 435 ("The amount of storage in the database for a particular image can be reduced by storing

compressed image data. The system can be implemented to decompress the image for image processing and display."). The term "generating data compressed image information" is confusing because it implies that the input circuit takes (uncompressed) input data and generates compressed data. However, the specification uses the term "generating" in the simple sense of "inputting." See spec. at 21) ("A plurality of sources 112A to 112F can be provided for generating image information"). Thus, "generating data compressed image information" requires only inputting compressed image information, such as compressed data stored in a memory, through one or more of the separate input channels in Fig. 1A or Fig. 1F. Decompression, which appellant apparently also calls "expansion," may be performed by the geometric processor (e.g., geometric modules 110A, 110B in Fig. 1A), which is also called an image processor. See spec. at 1 ("A geometric processor is provided for rotation, translation, expansion, compression, warping, 3D-perspective, vectors, windows, and other features.").

It is described that "many channels of geometrically processed images 110C can be overlaid with occulting priorities" (spec. at 17). Background image information, first object image information, and second object information are illustrated in the tank example (spec. at 388), where the background is the terrain and the first and second objects can be the tank and the tree.

The aircraft overlay (spec. at 403) and helicopter training simulator application (spec. at 471-472) are other examples of multiple overlays. "Overlays can be dynamically moving video images, such as real time video images from a video camera or video disk, ... that are dynamically manipulated" (spec. at 402), so there is support for video image information.

a translating circuit coupled to the data decompression circuit and generating first translated object image information in response to the first data decompressed object image information generated by the data decompression circuit, generating second translated object image information in response to the second data decompressed object image information generated by the data decompression circuit, and generating translated video image information in response to the data decompressed video image information generated by the data decompression circuit; and

This limitation merely says that the first and second object image information and the video image information are translated. The tank example (spec. at 388) where the tank moves (translates) with respect to the background and the viewport is one example. The specification describes that both the graphic overlays and the image overlays can be independently processed for geometric operations including rotation, translation, scaling, 3D-perspective, and warping (spec. at 388-389). The statement that video images are "dynamically manipulated" (spec. at 402) indicates the same kind of manipulations applied to static images, which includes translation.

an overlay circuit coupled to the graphics image circuit, coupled to the translating circuit, and coupled to the data decompression circuit, the overlay circuit generating overlaid image information by overlaying in response to the graphics image information generated by the graphics image circuit, in response to the first translated object image information generated by the translating circuit, in response to the second translated object image information generated by the translating circuit, in response to the data decompressed background image information generated by the data decompression circuit, and in response to the translated video image information generated by the translating circuit.

This limitation recites overlaying the graphics image information, first and second translated object image information, the video image information, and the background image information. The tank example (spec. at 388) is an example of overlaying first translated object information (the tank) and the background image information. The specification indicates that many translated, rotated, video, etc. images can be overlaid. See spec. at 17 ("many channels of geometrically processed images 110C can be overlaid with occulting priorities"). The overlay circuit can be the geometric processor (geometric module in Fig. 1A), which is also called an image processor. Overlaying can be done in various ways, such as (spec. at 386): "Images can be overlaid in different planes of different image processors; where occulting is selectable, such [as] in accordance with occulting priorities assigned to each plane, and motion therebetween is controllable, such as in accordance with independent image processors controlling

different images." Overlaying simply looks at a particular pixel position in each image plane and takes the pixel value in the image plane that is closest to the viewer (spec. at 395-396). Some image planes may contain images but not pixel values at the particular pixel position because the image is smaller than the background or is cropped.

For these reasons, we find that there is written description support for claim 180. The rejection of claim 180 is reversed.

Claim 236

236. A process comprising the acts of:
generating graphics image information;

These limitations are discussed in connection with
claim 180.

generating 64-sample blocks of data compressed
background image information;

generating 64-sample blocks of first data compressed
object image information;

generating 64-sample blocks of second data compressed
object image information;

Except for the "generating 64-sample blocks" terms, these limitations are discussed in connection with the input circuit of claim 180. Claim 236 is a process claim and does not recite "an input circuit" as in claim 180.

The "generating 64-sample blocks" limitation requires that the input data is formatted as "blocks" having 64 samples in each

block. Appellant argues that the memory architecture disclosure provides support for the "64-sample block" limitations (RBr75-77 § 2.4.17). The memory architecture in Figs. 6E-6N, is described as being arranged in 8x8 "blocks." We find that the specification does not describe that the input data is formatted in "64-sample blocks." However, the specification describes that the input information may be stored in a memory, such as the disclosed block memory, and then processed. Thus, compressed input data that is stored in a block memory contains "64-sample blocks." Accordingly, we interpret the claims with "64-sample blocks" to implicitly require storage in a "block" memory, where "block" implies a two-dimensional arrangement, such as 8x8.

generating data decompressed background image
information in response to the 64-sample blocks of data
compressed background image information;

generating first data decompressed object image
information in response to the 64-sample blocks of first
data compressed object image information;

generating second data decompressed object image
information in response to the 64-sample blocks of second
data compressed object image information;

Except for the "64-sample blocks" terms, these limitations are discussed in connection with the "data decompression circuit" in claim 180. Claim 236 is a process claim and does not recite "a data decompression circuit" as in claim 180. We have found support for the "64-sample blocks."

generating first cropped object image information in response to the first data decompressed object image information;

generating second cropped object image information in response to the second data decompressed object image information;

"Cropped" image information is discussed in connection with the tank example (spec. at 388). Implementation of cropping is also described (spec. at 393-396), e.g., "the known background color identifies the cropped portions of the overlay to identify whether the pixels are outside of the overlayable pixel images" (spec. at 393).

generating first cropped three dimensional perspective object image information in response to the first cropped object image information;

generating second cropped three dimensional perspective object image information in response to the second cropped object image information;

Three dimensional perspective with cropped images is illustrated in the helicopter example (spec. at 471-472):

The expansion capability discussed herein facilitates approaching an overlay object, such as a tree, and having the object expand in size as it is approached to simulate 3D-perspective. For example, a tree overlay placed over the background image as a very small overlay image can then be expanded to fill the viewport and to expand beyond filling the viewport as the helicopter approaches the tree and hides behind the tree.

For example, the tree overlay that is subject to three dimensional perspective processing could be a cropped object as in the tank example (spec. at 388). The specification indicates

that translation, rotation, 3D-perspective, etc. apply to all object images, whether cropped or not. The three dimensional perspective also used for aircraft simulation (spec. at 446-447).

generating combined image information in response to the graphics image information, in response to the first cropped three dimensional perspective object image information, in response to the second cropped three dimensional perspective object image information, and in response to the data decompressed background image information.

This "generating combined image information" is similar to "generating overlayed image information" in claim 180. The term "combined" is broader than "overlayed" because it does not imply how the image information is combined, but "overlayed" clearly provides support for "combined."

For these reasons, we find that there is written description support for claim 236. The rejection of claim 236 is reversed.

Claim 248

248. A process comprising the acts of:
generating graphics image information;

These limitations are discussed in connection with claim 180. It is noted that the "graphics image information" is not mentioned in the rest of the claim.

generating data compressed memory mapped background image information;

generating first data compressed memory mapped object image information;

generating second data compressed memory mapped object image information;

Except for the "memory mapped" terms, these limitations are discussed in connection with the "input circuit" of claim 180. Claim 248 is a process claim and does not recite "an input circuit" as in claim 180. The specification defines memory mapped as a "memory map stores an image as a 2-dimensional array of pixels" (spec. at 201). The various figures showing the memory show a memory mapped arrangement, e.g., the image hierarchy of Fig. 2A. Thus, there is written description support for these limitations.

generating data decompressed memory mapped background image information in response to the data compressed memory mapped background image information;

generating first data decompressed memory mapped object image information in response to the first data compressed memory mapped object image information;

generating second data decompressed memory mapped object image information in response to the second data compressed memory mapped object image information;

Except for the "memory mapped" terms, these limitations are discussed in connection with the "data decompression circuit" in claim 180, where we found support. Claim 248 is a process claim and does not recite "a data decompression circuit" as in claim 180. As noted, we find support for "memory mapped." Thus, there is written description support for these limitations.

generating first cropped memory mapped object image information in response to the first data decompressed memory mapped object image information;

generating second cropped memory mapped object image information in response to the second data decompressed memory mapped object image information; and

Except for the "memory mapped" terms, these "cropped" limitations are discussed in connection with claim 236 where we found support. As noted, we find support for "memory mapped." Thus, there is written description support for these limitations.

generating overlayed image information by overlaying the first cropped memory mapped object image information onto the data decompressed memory mapped background image information and overlaying the second cropped memory mapped object image information onto the data decompressed memory mapped background image information.

This "generating overlayed image information" is similar to "generating combined image information" in claim 236 and "generating overlayed image information" in claim 180, all of which find written description support in the discussion of overlaying and occulting in the specification.

For these reasons, we find that there is written description support for claim 248. The rejection of claim 248 is reversed.

Claim 288

288. A process comprising the acts of:

generating graphics image information;

generating 64-sample blocks of data compressed background image information;

generating 64-sample blocks of first data compressed object image information;

generating 64-sample blocks of second data compressed object image information;

generating data decompressed background image information in response to the 64-sample blocks of data compressed background image information;

generating first data decompressed object image information in response to the 64-sample blocks of first data compressed object image information;

generating second data decompressed object image information in response to the 64-sample blocks of second data compressed object image information;

The above limitations are discussed in connection with claim 236, which makes reference to claim 180. We find support for all of the limitations.

generating first translated object image information in response to the first data decompressed object image information;

generating second translated object image information in response to the second data decompressed object image information;

The specification describes that both graphic overlays and image overlays can be independently processed for geometric operations including rotation, translation, scaling, 3D-perspective, cropping to irregular features, and warping (spec. at 388-389). The tank example (spec. at 388) and the helicopter training simulator application (spec. at 471-472) are examples of translation of objects. We find written description support for these limitations.

generating first translated three dimensional perspective object image information in response to the first translated object image information;

generating second translated three dimensional perspective object image information in response to the second translated object image information;

The "three dimensional perspective" limitation is discussed in connection with claim 236. We find written description support for these limitations.

generating occulted image information by occulting the graphics image information, by occulting the first translated three dimensional perspective object image information onto the data decompressed background image information, and by occulting the second translated three dimensional perspective object image information onto the data decompressed background image information.

This "generating occulted image information" is similar to "generating overlayed image information" in claim 248, "generating combined image information" in claim 236, and "generating overlayed image information" in claim 180, and finds written description support in the discussion of overlaying and occulting in the specification.

For these reasons, we find that there is written description support for claim 288. The rejection of claim 288 is reversed.

Claim 606

606. A system comprising:

a communication link communicating input image information;

The specification discloses that "Input sources can be image sensors, image generators, memories, other image processing systems, digitizers, communication links, and multitudes of other input sources" (emphasis added) (spec. at 64).

an input circuit generating 64-sample blocks of data compressed background image information in response to the input image information, generating 64-sample blocks of first data compressed object image information in response to the input image information, generating 64-sample blocks of second data compressed object image information in response to the input image information, and generating a graphics image information in response to the input image information;

We find no problem with the limitation of "an input circuit" since a communication link input source implies an input circuit. We find no problem with the limitations of "in response to the input image information" since a communication link input source implies that the various images discussed in the specification, e.g., the tank example (spec. at 388), could be received on the communication link. The specification provides support for the input data being background image information, first object image information, second object image information, and graphics image information. As discussed in connection with claim 236, we find written description support for the limitation of "generating

64-sample blocks" where this limitation implicitly requires storage in a block (two-dimensional) memory.

a data decompression processor generating 64-sample blocks of data decompressed background image information in response to the 64-sample blocks of compressed background image information, generating 64-sample blocks of first data decompressed object image information in response to the 64-sample blocks of first data compressed object information, and generating 64-sample blocks of second data decompressed object image information in response to the 64-sample blocks of second data compressed object image information;

As discussed in connection with claim 236, the memory architecture in Figs. 6E-6N, is described as being arranged in 8x8 "blocks." The specification describes that the input information may be stored in a memory, such as the disclosed block memory, and then processed, for example by being expanded (decompressed). Thus, compressed input data that is stored in a block memory contains "64-sample blocks" and the decompressed input data would also be stored in a block memory containing "64-sample blocks." Accordingly, the "64-sample blocks" limitations implicitly require storage in a block memory.

a graphics processor generating textured graphics image information in response to the graphics image information;

We do not find written description support for the limitation of "generating textured graphics image information in response to the graphics image information." "Graphics image information" includes such things as "[c]ursors, crosshairs,

sights, and other such graphic symbols" (spec. at 386) and "[a]llphanumerics" (id.). "Textured image information" refers to patterns and images of things. See spec. at 472 ("For example, the background image can have textured mountains, hills, waterways, buildings, and meadows. A group of textured images; such as trees, buildings, and ground vehicles; can be overlaid on the background with occulting between images."). As far as we can determine from the specification, textured image information and graphics image information are two different kinds of images. We do not find any description of making "textured graphics image information" in response to "graphics image information."

Appellant points to Fig. 1A, programs GRAPH.ASC and LD.ASC, and pages 155-160, 246, 247, 389-391, and 544-560 as support for this limitation (Br16). Appellant does not say what element in Fig. 1A or what parts of the programs GRAPH.ASC and LD.ASC correspond to the claimed limitation. We have considered the patterns disclosed in LD.ASC (spec. at 548), but these are described as "textured image test patterns" (spec. at 389), not as textured graphics images and not textured graphics image information generated in response to graphics image information. Those reading the specification should not have to guess at what is meant by appellant's language--the specification must speak for itself without interpretation by appellant. Perhaps appellant's choice of language is misdescriptive; we cannot tell.

We find nothing in the cited pages of the specification that describes "generating textured graphics image information in response to the graphics image information."

Thus, we find no written description support for the limitation of "generating textured graphics image information in response to the graphics image information."

an image processor generating first irregular object image information in response to the 64-sample blocks of first data decompressed object image information and generating second irregular object image information in response to the 64-sample blocks of second data decompressed object image information;

Overlays of irregular objects are discussed in the specification (spec. at 388 & 393-396). Thus, there is descriptive support for this limitation.

a three dimensional perspective processor generating three dimensional perspective irregular object image information in response to the first irregular object image information and generating second three dimensional perspective irregular object image information in response to the second irregular object image information;

The specification describes generating three dimensional perspective irregular object information. For example, in the helicopter simulation, a tree with textured leaf and branch detail and cropped to an irregular external and internal profile (an irregular object) can be increased and decreased in size ("scaled") to simulate a three dimensional perspective (paragraph bridging spec. at 472-473).

an overlay circuit generating overlaid image information by overlaying in response to the textured graphics image information, in response to the 64-sample blocks of data decompressed background image information, in response to the first three dimensional perspective irregular object image information, and in response to the second three dimensional perspective irregular object image information; and

This "overlay circuit" is similar to the "generating occulted image information" in claim 288, "generating overlaid image information" in claim 248, "generating combined image information" in claim 236, and "generating overlaid image information" in claim 180, and finds written description support in the discussion of overlaying and occulting in the specification. However, as stated above, we find no support for the "textured graphics image information."

a display device displaying an image in response to the overlaid image information.

The various applications are intended to be displayed for viewing and multiple displays are disclosed in Figs. 1A and 1G.

In conclusion, we do not find written description support for the limitation of "generating textured graphics information in response to the graphics image information." The rejection of claim 606 and its dependent claims 607-614 is sustained.

The "making a product" claims

The examiner finds that there is no written description support for the following "making a product" limitations:

- "making a product" (claims 205, 209, 213, 217, 221, 225, 229, 233, 237, 241, 245, 249, 253, 257, 261, 265, 269, 273, 277, 281, 285, 289, 293, 297, 301, 305, 309, 313, 457,, 462, 466, 471, 475, 479, 483, 487, 492, 496, 500, 505, and 509);
- "making a signal product" (claim 459 and 542);
- "making a database product" (claim 464);
- "making a disk product" (claims 468 and 582);
- "making a graphic product" (claim 473);
- "making a building product" (claim 477);
- "making a video product" (claim 481);
- "making a vehicle product" (claims 485 and 551);
- "making an animation product" (claim 489);
- "making a manufactured product" (claims 494 and 566);
- "making a machined product" (claims 502 and 557);
- "making a location product" (claim 498);
- "making a machine product" (claim 539);
- "making a designed product" (claim 507);
- "making a communicated product" (claims 511 and 588);
- "making a communication product" (claims 529 and 598);
- "making a telephone product" (claim 514);
- "making a position product" (claim 517);
- "making a filter product" (claim 520);
- "making an oil product" (claims 523 and 572);

- "making an information product" (claim 526);
- "making a motion control product" (claim 532);
- "making a television product" (claim 535);
- "making a mineral product" (claim 545);
- "making an electronic product" (claim 548);
- "making a moving product" (claim 554);
- "making a processed product" (claim 560);
- "making a position control product" (claim 563);
- "making a geophysical product" (claim 514);
- "making a natural resource product" (claim 575);
- "making an entertainment product" (claim 579);
- "making a positioned product" (claim 585);
- "making a data compressed product" (claim 591);
- "making an architectural product" (claim 594);
- "making a display product in response to ...; and making a second product in response to the display product" (claims 458, 472, 484, 497, 510, 519, 528, 538, 547, 556, 565, and 574);
- "making a display product; and making a second product in response to the display product" (claims 584 and 593);
- "making a first product in response to ...; and making a second product in response to the first product" (claims 460, 478, 486, 503, 512, 524, 530, 543, 549, 561, 567, 586, and 592);
- "making a first product; and making a second product in response to the first product" (claims 469, 495, 518, 536, 555, 573, 580, and 599);
- "making a design product; and making a second product in response to the design product" (claims 463, 476, 488, 501, 513, 522, 531, 541, 550, 559, and 568);

- "making a design product in response to ...; and making a second product in response to the design product" (claims 578, 587, and 597);
- "making a first product in response to ...; making a second product in response to the first product; and making a third product in response to the second product" (claims 465, 474, 490, 499, 515, 521, 533, 540, 552, 558, 570, 576, 583, and 595);
- "making a first product; making a second product in response to the first product; and making a third product in response to the second product" (claims 482, 508, 527, 546, 564, and 589);
- "making a computer aided design product in response to ...; and making a second product in response to the computer aided design product" (claims 467, 480, 493, 506, 516, 525, 534, 544, 553, 562, 571, 581, and 590).

The examiner states (EA20) that the term "product" or "products," is used in the specification only in the mathematical sense, such as the result of a multiplication or a sum-of-products, with the exception of the following (spec. at 454):

Although the final product of a graphic art system may be static photographs, real time operation permits an operator to efficiently and rapidly configure images.

The examiner states that "[t]his use does not appear to be related to any of the elements recited in the 'product' claims or the making of a 'product' in response to other claimed limitations" (EA21). The examiner finds no support for the other "product" terminology such as "oil product," "mineral product," "geophysical product," etc. (EA18-24).

Analysis

One "making a product" claim is, for example, claim 205: "A process as set forth in claim 204, further comprising the act of making a product in response to the overlayed image information." The last step of claim 204 is "generating overlayed image information." The step of "making a product" is an additional step (as indicated by the "further comprising" and "in response to" limitations) to the process of "generating overlayed image information" in claim 204. Thus, the product is not the result of the process, but is the result of some additional "making" step. The specification does not describe the "product" that is made or the additional "making" step. We agree with the examiner that most descriptions of "products" in the specification have nothing to do with the claimed products, but deal with such things as the result of a multiplication operation, e.g., "multiplying the corresponding intensity and weight together to generate product signals 520J" (spec. at 162) and "sum-of-the-products" (spec. at 163). Although the specification states that "the final product of a graphic art system may be static photographs," we agree with the examiner that there is no way to tell that the product is a "static photograph." For example, the last step of claim 204 is "generating overlayed image information" which is a step which takes place in computer memory. Regarding the "making a product"

claim 205, there is no way a photograph can be "made" from this overlaid image information until it is displayed and this step is not claimed. Thus, we would have to find claim 205 to be fatally incomplete if the product is intended to be a photograph. We will not construe a claim in such a way as to be indefinite so that it will meet the written description. One of ordinary skill in the art cannot objectively determine from the specification what appellant means by "product" or by "making."

Further, there is absolutely no written description in the present application for making the specific claimed products, such as making an "oil product," "mineral product," "natural resource product," "geophysical product," "electronic product," "machine product," "location product," "telephone product," etc. There is also no written description for making a product and then making a second product and even a third product as in the last eight "bullets" summarizing the claims. It is simply impossible for one of ordinary skill in the art to know what is meant by the term "product," much less where the specification describes "making" such a product. Appellant's arguments have been considered, as discussed below, but are not persuasive. Appellant provides no explanation of what is meant by "products" or "making" and we cannot determine by reading the specification what the terms are intended to cover. Manifestly, the time for providing explanations was in the brief and not for the first

time in a request for rehearing. The rejection of dependent claims 205, 209, 213, 217, 221, 225, 229, 233, 237, 241, 245, 249, 253, 257, 261, 265, 269, 273, 277, 281, 285, 289, 293, 297, 301, 305, 309, 313, 457-460, 462-469, 471-490, 492-503, 505-536, 538-576, 578-595, and 597-599 based on lack of written description support under § 112, first paragraph, is sustained.

Appellant's arguments are unpersuasive

Appellant argues that the rejections based on "making a product" are erroneous in light of the statute and the law of the Federal Circuit (Br58-62 § 8.2.10). It is argued that § 112, first paragraph, requires that "[t]he specification must contain a written description of the invention and of the manner and process of making and using it ..." (emphasis added).

The specification does not describe what the "product" is or what physical acts are involved in "making" the product. That is, appellant uses generic terms for both the product and the act of making, without ever trying to show what in the specification corresponds to those terms. The term "making" in § 112 does not mean that an applicant can just claim "making" without describing the actual acts of making. New arguments in any request for rehearing will not be considered.

Appellant argues that "the invention unquestionably constitutes a product" (Br58) and "[t]here can be no doubt that a product is made when practicing the invention" (Br58).

Again, appellant does not explain what the "product" is or identify the acts of "making." Many things in the specification are products, such as computers and circuit boards, but these cannot correspond to claimed products because they are necessary to perform the acts of the process and are not "products" which are "made" as an additional step to the process.

Appellant argues that the § 112, first paragraph, rejections regarding product terminology are improper because 35 U.S.C. § 271(g) expressly provides protection of a "product" made by the claimed process and covers "products" even without reciting "product" terminology (Br60).

Section 271(g) excludes others from using or selling throughout the United States, or importing into the United States, products made by a patented process. The product under § 271(g) is the end result of the process, such as a pharmaceutical product made by a certain process. Thus, it is known what the product is, unlike here where there is a further step of making that is not described and where appellant refuses to divulge the identity of the product. "35 U.S.C. § 271(g) is limited to physical goods that were manufactured." Bayer AG v. Housey Pharm., Inc., 340 F.3d 1363, 1368, 68 USPQ2d 1001, 1002 (2003). Section 271(g) does not answer the questions of where the specification describes what is meant by a "product" or where it describes making the unidentified product as an additional

step after the end of the process. The "making a product" claims do not recite what specific item constitutes the "product" made by the process of the independent claim. The issue is not whether the term "product" is found somewhere in the patent statute, or whether the result of a process is always a "product," but whether there is written description support for the additional step of "making a product," in particular, for what the "product" is and how it is "made." If appellant is somehow arguing that § 271(g) allows claiming using the generic term "product" without disclosing what the product is or how it is made, this is error. Section 271(g) is an infringement provision and has nothing to do with claiming.

Appellant argues that the § 112, first paragraph, rejections regarding product terminology are in conflict with the law of the CCPA (and, hence, the Federal Circuit), which states that an invention can be claimed both as a "process" and a "product," so it is clearly permitted to claim both the process and the further act of making a product in response to the process or as a step in the process (Br61-62).

This argument simply does not address the rejection. The "making a product" claims do not recite that the product is what is made by the process of the independent claim, but recite a product made by an additional step, where there is no written description of the "product" or the step of "making."

Appellant argues that "product" terminology is proper to describe a "machine" or "manufacture" (Br60-61). It is also argued that the disclosed signals constitute "products" (Br61).

These arguments do not point out where the "product" or step of "making" are described, so we cannot tell if it exists, what it is, or how it is constructed. This is the reason for the written description rejection. We interpret the term "product" to mean a tangible physical structure, i.e., something within a statutory class of subject matter, not an intangible signal. This interpretation is consistent with recitations such as "oil product," "natural resource product," "machine product," "location product," "telephone product," etc., which sound like physical things, and with appellant's arguments that the product is a machine or manufacture (Br60-61). We find no written description of taking an output signal and constructing some physical structure, if that is what is meant.

We also disagree with the argument that "signals" are a "manufacture" and hence a product; however, even if this argument were true, appellant has not shown what signals in the specification correspond to the claimed "products" or what constitutes the step of "making." The three product classes of statutory subject matter (machine, manufacture, and composition of matter) have traditionally required physical structure or matter. A signal, while physical, does not have a tangible

physical structure and does not fall within any of the statutory categories. See In re Bonczyk, 10 Fed. Appx. 908 (Fed. Cir. 2001) (unpublished) ("fabricated energy structure" does not correspond to any statutory category of subject matter and it is unnecessary to reach the alternate ground of affirmance that the subject matter lacks practical utility). Appellant's reliance on § 271(g) for saying that signals can be products is misplaced. "35 U.S.C. § 271(g) is limited to physical goods that were manufactured." Bayer AG v. Housey Pharm., Inc., 340 F.3d at 1368, 68 USPQ2d at 1002. A "signal" does not fit any of the statutory classes of subject matter under 35 U.S.C. § 101. A "composition of matter" "covers all compositions of two or more substances and includes all composite articles, whether they be results of chemical union, or of mechanical mixture, or whether they be gases, fluids, powders or solids." Shell Development Co. v. Watson, 149 F. Supp. 279, 280, 113 USPQ 265, 266 (D.D.C. 1957), aff'd, 252 F.2d 861, 116 USPQ 428 (D.C. Cir. 1958). A signal is not matter and thus is not a composition of matter. "The term machine includes every mechanical device or combination of mechanical device or combination of mechanical powers and devices to perform some function and produce a certain effect or result." Corning v. Burden, 56 U.S. (15 How.) 252, 267 (1854); see also Burr v. Duryee, 68 U.S. (1 Wall.) 531, 570 (1863) (a machine is a concrete thing, consisting of parts or of certain

devices and combinations of devices). A signal, while physical, has no concrete tangible physical structure, and does not itself perform any useful, concrete and tangible result; thus, a signal does not fit within the definition of a machine (or product). The Supreme Court has read the term "manufacture" in accordance with its dictionary definition to mean "the production of articles for use from raw or prepared materials by giving to these materials new forms, qualities, properties, or combinations, whether by hand-labor or by machinery." Diamond v. Chakrabarty, 447 U.S. at 308, 206 USPQ at 196-97 (quoting American Fruit Growers, Inc. v. Brogdex Co., 283 U.S. 1, 11, 8 USPQ 131, 133 (1931), which, in turn, quotes the Century Dictionary). Other courts have applied similar definitions. See American Disappearing Bed Co. v. Arnaelsteen, 182 F. 324, 325 (9th Cir. 1910), cert. denied, 220 U.S. 622 (1911). These definitions require physical substance, which a signal does not have. Accordingly, we conclude that a signal is not a product.

Appellant argues that claims reciting "making a product" have already been issued in related U.S. patent 5,584,032 and, since the claims in that patent have a presumption of validity, it must be accepted that there is written description for the terminology in this application (Br35).

The fact that other patents have been issued with similar language is irrelevant. See In re Riddle, 438 F.2d 618, 620, 169 USPQ 45, 47 (CCPA 1971) ("two wrongs cannot make a right").

Appellant argues that the product terminology objected to based on § 112, first paragraph, has ample antecedent basis in the instant disclosure (Br62-70 § 8.2.11). Appellant refers to the description of circuits and implementation details, various commercial products cited in the disclosure for making the disclosed product, the description of the system being "constructed" or "implemented" or "practiced," which are all stated to provide support for making a product.

The fact that the structures in the specification can be considered "products" does explain how these structures correspond to the "product" in the "making a product" claims. Moreover, since the apparatuses are already in existence, we fail to see any product being "made" by an additional step, especially since what appellant insists is being made is a "machine" or manufacture." For example, appellant points to circuit boards (Br67-68), but it is clear that circuit boards are part of the machine that performs the claimed process and is not a product made by the machine. If appellant is using the phrase "making a product" to have some meaning other than the conventional meaning of constructing or forming a physical thing from individual components, it is not clear. Appellant has not shown where the

specification describes the "product" or "making a product" either expressly or implicitly.

Appellant argues that the product terminology objected to based on § 112, first paragraph, has ample antecedent basis in the disclosures of prior patents that are expressly incorporated by reference (Br71-73 § 8.2.12).

This does not explain how one of ordinary skill in the art would have understood from the present disclosure to look for "making a product" terminology in the documents incorporated by reference. "To incorporate material by reference, the host document must identify with detailed particularity what specific material it incorporates and clearly indicate where that material is found in the various documents." Advanced Display Systems Inc. v. Kent State University, 212 F.3d 1272, 1282, 54 USPQ2d 1673, 1679 (Fed. Cir. 2000). The present application provides no guidance as to where the "making a product" limitations are to be found in material incorporated by reference.

Appellant argues that the examiner has made relevant admissions about the product claim limitations (RBr86-89 § 2.5). Appellant points to statements by examiners in other copending applications that the products "would have been obvious" (RBr86; RBr87) in connection with obviousness rejections. It is argued that "[t]he Examiner even provides examples of the products and

how he would read Marsh on a product" (RBr87-88), where appellant recites quotes from other cases. Appellant concludes (RBr89):

Because such product terminology is admitted by the Examiner to have been obvious, the Examiner cannot now proclaim that "the specification fails to provide an adequate written description for the claimed products, or even what these claimed 'products' are intended to be" (Answer at 24).

These arguments demonstrate appellant's misunderstanding of the law of written description. Obviousness is not the test for written description. "One shows that one is 'in possession' of the invention by describing the invention, with all of its claimed limitations, not that which makes it obvious." Lockwood v. American Airlines Inc., 107 F.3d at 1572, 41 USPQ2d at 1968.

For the reasons stated above, appellant's arguments are unpersuasive that there is support for the "making a product" claims.

Conclusion

We have sustained the rejection of independent claim 606 and its dependent claims 607-614 because we find no written description support for the limitation of "generating textured graphics image information in response to the graphics image information." The rejection of independent claims 117, 120, 123, 126, 129, 132, 153, 156, 165, 201, 204, 208, 212, 216, 220, 224, 252, 256, 268, and 600 and their dependent claims must also be sustained because they contain the same limitation. Therefore,

the written description rejection of claims 117-134, 153-158, 165-167, 201-227, 252-259, 268-271, 457-465, 479-482, 509-530, 550-555, 562-564, 600, and 606-614 is sustained.

We have also sustained the rejection of dependent claims 205, 209, 213, 217, 221, 225, 229, 233, 237, 241, 245, 249, 253, 257, 261, 265, 269, 273, 277, 281, 285, 289, 293, 297, 301, 305, 309, 313, 457-460, 462-469, 471-490, 492-503, 505-536, 538-576, 578-595, and 597-599 because we find no written description support for the "making a product" limitations.

We have reversed the rejection of claims 180, 236, 248, and 288. The rejection of the remainder of the claims stands or falls together with this rejection. Thus, the rejection of claims 135-152, 159-164, 168-200, 228, 230-232, 234-236, 238-240, 242-244, 246-248, 250, 251, 260, 262-264, 266, 267, 272, 274-276, 278-280, 282-284, 286-288, 290-292, 294-296, 298-300, 302-304, 306-308, 310-312, 314, 315, 470, 491, 504, 537, 577, 596, and 601-605 is reversed.

Enablement

Legal standards

The enablement requirement is separate and distinct from the written description requirement of § 112, first paragraph. See Vas-Cath, Inc. v. Mahurkar, 935 F.2d at 1563, 19 USPQ2d at 1117. A specification may enable one skilled in the art to make and use an invention and yet still not describe it. Id. at 1562,

19 USPQ2d at 1115. "The test of enablement is whether one reasonably skilled in the art could make or use the invention from the disclosures in the patent coupled with information known in the art without undue experimentation." United States v. Telectronics, Inc., 857 F.2d 778, 785, 8 USPQ2d 1217, 1223 (Fed. Cir. 1988). A patent need not teach, and preferably omits, what is well known in the art. Paperless Accounting, Inc. v. Bay Area Rapid Transit System, 804 F.2d 659, 664, 231 USPQ 649, 652 (Fed. Cir. 1986). The factors to be considered in determining whether a disclosure would require "undue experimentation" are summarized in In re Wands, 858 F.2d 731, 737, 8 USPQ2d 1400, 1404 (Fed. Cir. 1988). What must be enabled is the claimed invention.

Analysis

The rejection generally concludes that the elements, interconnections, and functions are not enabled (EA24-30). The rejection states, for example (EA25-26):

While there may be some rudimentary disclosure in the specification directed to a compression/decompression system, there are none of the details necessary to perform the a [sic] the variously claimed "combining" image portions (where the "combining" includes "overlying", "compositing", and "occluding"); generating "three dimensional perspective" image information; and the "cropping" of image information in combination with (or as part of) the compression (and decompression) system. While the features may be readily available today (in 2001), such as in video processing and virtual reality image creation, for example, they were not taught by Appellant and Appellant is not entitled to the claims directed thereto. These various elements were not at all discussed in any single embodiment of the specification or shown in any Figure. Therefore, the specification cannot

be enabling for the specifically claimed combination of these elements.

We do not find these general allegations of lack of enablement to be persuasive since they fail to address the fundamental legal issue of why it would have taken undue experimentation by one of ordinary skill in the art to make the claimed invention. Moreover, the rejection appears to be based, in part, on the finding of lack of written description, which is not the test for lack of enablement: the specification may enable one skilled in the art to make and use the claimed invention without the claimed invention being described.

In the response to the arguments section of the answer, the examiner discusses the eight undue experimentation factors of Wands (EA86-94 § 11.3). While the examiner is on the right track towards providing reasons to support the enablement rejection, the analysis fails to convincingly address the claimed invention because it does not specifically address the claimed invention or adequately consider the level of skill in the prior art or the state of the prior art. We discuss claim 180 as an example.

Claim 180 recites "a graphics image circuit generating graphics image information." Graphics image information include "[c]ursors, crosshairs, sights, and other such graphic symbols" and "[a]lphanumerics" (spec. at 386). The examiner has not shown that it was not within the level of skill of one of ordinary skill in the electronics and computer art to make such a graphics

circuit in the 1983 time frame. Histories of the computer show that, for example, the Alto computer from Xerox PARC in 1981 had bitmapped graphics, overlapping windows, a mouse pointer, and a graphical user interface known as WIMP-Windows, Icons, Menus, and Pointers. See, e.g., Mike Tuck, The Real History of the GUI, <http://www.sitepoint.com/article/real-history-gui> (downloaded August 11, 2004) (19 pages) at page 6 of 19 (copy attached). Cursors were well known. See "Cursor" in Encyclopedia of Computer Science (Van Nostrand Reinhold Co. 1976), p. 378-79.²

Claim 180 further recites "an input circuit generating" four kinds of compressed image information. As noted in the written description discussion, "generating compressed image information" only requires inputting compressed data. The specification discloses that the purpose of compression is to save storage space and, thus, any type of compression which was known in the art for this purpose is suitable. The fact that the type of compression is not expressly disclosed does not indicate lack of enablement. No reason has been provided why image compression was not within the level of ordinary skill in the art in the 1983 time frame. Image compression, such as Huffman coding developed in the 1950s, was one of the earliest types of compression used

² We assume that appellant was not aware of any of the prior art cited by the Board in this opinion. It would be inconsistent with the duty of disclosure to argue the patentability of the claims during prosecution and on appeal while not citing prior art material to patentability.

in applications like facsimile machines. See "Picture Compression" in Encyclopedia, pp. 635-636. The background image information, first and second object information, and video image information are just still or moving images which were well known in the 1983 time frame as were input circuits.

Claim 180 further recites "a data decompression circuit" for decompressing the compressed input information. Again, we have been given no reason why decompression was not within the level of ordinary skill in the art in the 1983 time frame.

Claim 180 further recites "a translating circuit" for translating the first and second object image information and the video image information. Since Marsh shows a translating circuit in a more complicated computer graphics environment, the state of the prior art indicates that translating circuits could be made without undue experimentation. Moreover, translating requires only moving pixel values from one bitmap position to another and is considered within the level of skill in the art at the time. As evidenced in The Real History of the GUI (p. 5 of 19) and Graphics in Overlapping Bitmap Layers, pp. 349-350, `bitblt()` (more commonly written now as `BitBlt()`), a bit block transfer instruction that moves (translates) a block of data from a source location to a destination location, was known in 1983. See also "Picture Manipulation" in Encyclopedia, pp. 304-307.

Claim 180 lastly claims "an overlay circuit" for overlaying the graphics image information, the first and second object image information, and the video image information onto the background image information. The specification discloses that the image values are stored in image plane memories and can be overlaid based on an occulting priority by choosing to display the pixel value in the image closest to the viewer as described in the paragraph bridging pages 395-396 of the specification. Moreover, overlay circuits of the type disclosed by appellant were known in the art as evidenced by Bieneman, U.S. Patent 4,554,538, issued November 19, 1985, filed May 25, 1983 (copy attached); as shown in Fig. 2, up to eight images can be overlaid, where Figs. 3-5 show overlaid images, and Figs. 4 and 5 show translation of one image overlaying another to a position where the images are not overlaid. See also "Enhancing the Illusion of Reality" in Encyclopedia, p. 306; "Picture-Processing Software" in Encyclopedia, p. 638; Marc Levoy, A Color Animation System Based on the Multiplane Technique, ACM SIGGRAPH Computer Graphics, Proceedings of the 4th annual conference on computer graphics and interactive techniques, Vol. 11, Issue 2, July 1977; Richard G. Shoup, Color Table Animation, ACM SIGGRAPH Computer Graphics, Proceedings of the 6th annual conference on computer graphics and interactive techniques, Vol. 13, Issue 2, August 1979 (item 4 in Introduction, pp. 8-9). Thus, the state of the prior art factor

of Wands indicates that an overlay circuit could be made by one of ordinary skill in the art without undue experimentation.

We conclude that the examiner has failed to establish a prima facie case that claim 180 is not enabled. We also conclude that the examiner has failed to establish a prima facie case of nonenablement as to claims 236, 248, 288, and 606. Dependent claims 205, 209, 213, 217, 221, 225, 229, 233, 237, 241, 245, 249, 253, 257, 261, 265, 269, 273, 277, 281, 285, 289, 293, 297, 301, 305, 309, 313, 457-460, 462-469, 471-490, 492-503, 505-536, 538-576, 578-595, and 597-599 stand rejected based on a lack of enablement for the "making a product" limitations. Although the enablement rejection might be applied to the "making a product" claims, because without knowing the identity of the claimed products it is not clear that the specification would enable one skilled in the art to make and use the claimed products without undue experimentation, we think this is best treated as a lack of written description issue. The rejection of claims 117-315 and 457-614 under 35 U.S.C. § 112, first paragraph, based on a lack of enablement is reversed for failure to state a prima facie case. We do not hold that the claims are enabled.

Obviousness

Content of the references

Netravali discloses a technique for estimating the displacement and/or velocity of objects between frames in a video picture and for encoding the transform coefficient of the picture using motion compensation (col. 1, lines 7-12). The rejection relies on both the prior art of Fig. 1 and the more complicated invention of Fig. 5; however, we think Figs. 1 and 2 are better drawings for discussion. The intensity values I of a block of N picture elements (pixels or pels) from a frame of video information are converted by a linear transform encoder into a corresponding set of N output coefficients C (Fig. 1; col. 2, lines 42-47). A predictor circuit 102 computes a prediction coefficient \hat{C} from the corresponding block of pixels in the previous frame (Fig. 1; col. 3, lines 1-6). The difference between the true value C and the predicted value \hat{C} from subtraction circuit 109 is an error value e which is applied to a quantizer 103 (Fig. 1; col. 3, lines 7-9). The quantizer output Q is the output of the encoder and can be further processed, e.g., by comparison with a threshold or by run length coding (col. 3, lines 9-12). Netravali implies compression in the quantizer due to thresholding of the error value (col. 1, lines 14-37). The invention of Netravali compensates for the motion of objects between frames making the prediction errors

smaller than the prior art (col. 3, lines 20-41). Thus, the image is reconstructed in the predictor 200 of Fig. 2 and used to compute the predicted value \hat{C} based on the motion of the object shown in Fig. 3. Netravali is an encoder, not an image generation system and does not involve overlaying images.

Marsh discloses an aircraft flight simulation system 10 with visual capabilities provided by a digital visual system 12 (col. 2, lines 22-23). Terrain data, such as runways, towers, hangers, roads, rivers, fields, moving objects, etc., are stored in a terrain database 48 (col. 2, lines 39-41). The "visual system 12 may process and display terrain features consisting of points, lines, closed convex polygons, or combinations thereof" (col. 2, lines 41-43). The OBJ CODE in the instruction identifies the type of object (table at bottom of col. 7). The objects are faces defined by vertices, where B is the number of vertices in the face (col. 8, lines 11-12). For example, in a Load A (LDA) instruction, the four LSB reveal the number of subsequent data words in the group (col. 4, lines 34-36) and a LDA instruction causes B sets of X, Y, Z coordinates to be stored in the RAM (col. 4, lines 49-55). Thus, the end of hanger 240 in Fig. 2A would be a face with B=5 vertices and the scene would be assembled from a number of features consisting of faces. The vertices can be rotated with a conventional rotation matrix (col. 9, lines 33-40; col. 12, line 52 to col. 13, line 25),

translated by conventional translation matrices (col. 11, lines 18-35), and the visibility of faces can be tested in the conventional way by using the dot product (col 13, lines 39-57). Thus, Marsh is a computer graphics display system where objects are drawn from the coordinates of the vertices and does not involve overlaying of flat images as in the disclosed invention. However, we recognize that the claims do not define the nature of the image information as bitmapped graphic image information.

Analysis

The rejection specifically addresses claims 180, 236, 248, 288, 606, the claims argued by appellant for written description, and also addresses claims 189, 192, and 612. The examiner apparently treats these claims as representative of the claims on appeal and we will do likewise.

Claim 180

The examiner finds that Netravali discloses an input circuit generating data compressed image information at the output of the quantizer and data decompressed information in the predictor circuit in Figs. 1 and 5 (EA33).

Netravali implies compression by the quantizer (col. 1, lines 14-37). Figure 2 of Netravali is a better showing of decompression for the examiner's purpose because the original image is reconstructed in the predictor circuit 200, as opposed

to Fig. 1 where the predictor circuit 102 uses coefficients. Thus, Netravali technically involves compression and decompression. As noted in the written description discussion, "generating compressed image information" is used by appellant in the sense of inputting compressed data (e.g., from a disk memory), and does not require inputting data and then compressing it. Thus, any teaching of storing image data in a compressed form to save space and decompressing it for use would have met the compression and decompression limitations of the claims.

However, other than compression and decompression, Netravali has nothing to do with the claimed image system. Netravali is an encoder and does not overlay images as required by all of the claims. Claim 180 recites five separate types of image information: background, first and second object, video, and graphics. Since Netravali operates on frames of video information, Netravali discloses video image information. The examiner finds that "objects" in Netravali (at col. 1, line 8) imply at least first and second objects which are compressed by encoding (EA33). The examiner finds that the pictures in Netravali are graphics image information (EA33-34). The examiner finds that Netravali does not disclose generating background image information but takes Official Notice that this was well known and conventional (EA34). The examiner cites Marsh as

support for this position where background image information is the image farthest away from the viewer (EA34).

The "object" in Netravali is a block of pixels representing an object within the frame block. The invention determines movement of this object from one frame to the next as shown in Fig. 3. The objects in Netravali are not separate from the video information in the frame and are not translated and overlayed as later claimed. Netravali has only one object image, the frame of video, that is compressed and decompressed. The image in Netravali cannot be graphics image information and first and second object image information at the same time that it is considered video image information. Thus, we find that Netravali does not disclose graphics image information and first and second object image information. As to the background image information, Marsh stores individual items, such as the faces of buildings, where the faces are defined by vertices, that are used to construct the image of a scene as in Fig. 2A. It is not known what is background image information until the entire scene is constructed, whereas the claims require specific background image information which will be overlayed with other objects. In the disclosed invention, the background image information is the two dimensional image over which objects are overlayed. Even assuming that Marsh teaches background information, we fail to find any motivation to modify Netravali to have separate

background information. The images in Netravali are two dimensional video images where part of the image would be interpreted by a human to be background to an object within the frame, but the image is not overlayed as claimed. Thus, Netravali also does not disclose background image information.

The examiner finds that Netravali does not disclose a translating circuit, but finds that a translating circuit was well known in the art as evidenced by Marsh (EA34). The examiner concludes that it would have been obvious to use Marsh's translation circuit in Netravali because it would have enhanced the visual display of objects since Netravali is concerned with the displacement of objects (EA34-35).

While we agree that translating circuits were well known as evidenced by Marsh, there is no reason why Netravali would require a translating circuit as taught by Marsh since it is not concerned with translating images to be overlayed.

The examiner finds that Netravali does not disclose overlaying, however, the examiner notes that Official Notice was taken in the final rejection that generating overlayed information was well known and conventional (EA35). The examiner finds that Marsh teaches this feature because it simulates a three dimensional environment where some objects are hidden (occulted) by other objects and concludes that it would have been obvious to combine Netravali and Marsh because this would have

allowed enhanced processing of moving objects and because Netravali would have provided a way of decompressing Marsh's compressed image information (EA36). The examiner states that, in Marsh, the overlay circuit is coupled to the translating circuit since both are within the image processor 42 and in employing Marsh's overlay circuit the overlaid image information would be generated in response to the various image information, i.e., the graphics image information, the first and second translated object image information, the background image information, and the translated video image information (EA36).

While we have personal knowledge that overlaying of two dimensional images was well known in such applications as video games, the case law requires evidence of this fact. See In re Zurko, 258 F.3d 1379, 1386, 59 USPQ2d 1693, 1697 (Fed. Cir. 2001) ("With respect to core factual findings in a determination of patentability, however, the Board cannot simply reach conclusions based on its own understanding or experience -- or on its assessment of what would be basic knowledge or common sense."); In re Lee, 277 F.3d 1338, 1345, 61 USPQ2d 1430, 1435 (Fed. Cir. 2002). As to the statement about the overlay circuit in Marsh, the examiner does not actually point to an overlay circuit. Overlaying in Marsh is accomplished by graphically generating all the shapes, composing them in a scene, and determining the visibility of the shapes, not by overlaying

separate images on the background. In any case, we fail to see any reason why one skilled in the art would have been motivated to apply overlaying in Netravali since Netravali is just an improved encoder. As to the argument about decompressing, we note that, in Marsh, "the terrain data base is compressed because each object face is stored in the data base as a single initial point plus a series of addresses and a scale factor, rather than a plurality of separate vertices" (col. 36, lines 60-63). This compression has nothing whatsoever to do with the compression by encoding and quantizing in Netravali and would provide no motivation for the combination of Netravali and Marsh. It is not understood how or why Netravali would be modified to have the features of Marsh.

For these reasons, we conclude that the examiner has failed to establish a prima facie case of obviousness with respect to the rejection of claim 180.

Claim 236

The examiner's analysis of claim 236 is basically the same as for claim 180 except that the examiner addresses the limitations of "64-sample blocks," "cropped image information," and "three dimensional perspective image information." The "64-sample blocks," "cropped image information," and "three dimensional perspective image information" limitations are additional limitations to those addressed in connection with

claim 180. Thus, the rejection of claim 236 has the same deficiencies as claim 180. We conclude that the examiner has failed to establish a prima facie case of obviousness with respect to the rejection of claim 236.

Claim 248

The examiner's analysis of claim 248 is basically the same as for claims 180 and 236 except that the examiner addresses the "memory mapped" limitation. The "memory mapped" limitation is an additional limitation to those addressed in connection with claim 180. Thus, the rejection of claim 248 has the same deficiencies as claim 180. We conclude that the examiner has failed to establish a prima facie case of obviousness with respect to the rejection of claim 248.

Claim 288

The examiner's analysis of claim 288 is basically the same as for claims 180, 236, and 248 except that the examiner addresses the limitation of "generating occulted image information." As discussed in connection with claim 180, overlaying in Marsh is accomplished by graphically generating all the shapes, composing them in a scene, and determining the visibility of the shapes, not by overlaying separate graphic image information and first and second object image information onto the background image information, as claimed. In any case,

we fail to see any reason why one skilled in the art would have been motivated to apply occulting of Marsh in Netravali since Netravali is just an improved encoder. We conclude that the examiner has failed to establish a prima facie case of obviousness with respect to the rejection of claim 288.

Claim 606

The examiner's analysis of claim 606 is basically the same as for claims 180 and 236 except that the examiner addresses the limitations of "a communication link," "a graphics processor generating textured graphics image information," "first irregular object image information," "second irregular object image information," and "a display device" (EA41-43). These limitations are additional limitations to those addressed in connection with claims 180 and 236. Thus, the rejection of claim 606 has the same deficiencies as claims 180 and 236. We conclude that the examiner has failed to establish a prima facie case of obviousness with respect to the rejection of claim 606.

Claims 192, 189, and 612

The examiner discusses features in other claims, such as the "rotating circuit" in claim 192 and others, "warped graphics image information" in claim 189 and others, and the "timeshared circuit" of claim 612 (EA43-44). These are additional features to those discussed in claim 180 and do not alter the basic

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decision. We conclude that the examiner has failed to establish a prima facie case of obviousness with respect to the rejection of claims 192, 189, 612.

The "making a product" claims

The rejection separately treats "making a product" claims (EA44-46). The "making a product" claims are all dependent claims and the examiner's reasoning regarding the "making a product" limitations does not cure the deficiencies with respect to the independent claims. Accordingly, the rejection of claims 205, 209, 213, 217, 221, 225, 229, 233, 237, 241, 245, 249, 253, 257, 261, 265, 269, 273, 277, 281, 285, 289, 293, 297, 301, 305, 309, 313, 457-460, 462-469, 471-490, 492-503, 505-536, 538-576, 578-595, and 597-599 stands or falls together with the rejection of the independent claims.

Conclusion

Since the examiner has failed to establish a prima facie case of obviousness for any of claims 180, 236, 248, 288, 606, 189, 192, and 612, which the examiner has taken as representative, the rejections of claims 117-315, 457-607, and 610-614 are reversed.

NOTICE REGARDING ANY REQUEST FOR REHEARING

Any request for rehearing of this decision under 37 CFR § 1.197(b) is limited to points of fact and/or law which appellant believes were overlooked or misapprehended in rendering this decision. New arguments which were not presented in the appeal brief or reply brief will not be considered. See Ex parte Hindersinn, 177 USPQ 78, 80 (Bd. App. 1971) (argument advanced in petition for reconsideration not advanced in the brief or the reply brief are not properly before us); cf. Pentax Corp. v. Robison, 135 F.3d 760, 762 (Fed. Cir. 1998) (citing cases supporting the proposition that issues not raised before the court are not addressed on rehearing). New arguments may cause the request for rehearing to not be considered.

In any request for rehearing, appellant must state with particularity each point of law or fact he believes was overlooked or misapprehended, must argue in support of each point, and must refer with particularity to where the argument was made originally in the appeal brief or reply brief. Failure to point to the page and line number of where the argument was originally made in the brief or reply brief will be considered evidence of a new argument.

CONCLUSION

The rejections of claims 117-134, 153-158, 165-167, 201-227, 229, 233, 237, 241, 245, 249, 252-259, 261, 265, 268-271, 273, 277, 281, 285, 289, 293, 297, 301, 305, 309, 313, 457-469, 471-490, 492-503, 505-536, 538-576, 578-595, 597-600, and 606-614 under 35 U.S.C. § 112, first paragraph, based on lack of written description are sustained. The rejection of claims 135-152, 159-164, 168-200, 228, 230-232, 234-236, 238-240, 242-244, 246-248, 250, 251, 260, 262-264, 266, 267, 272, 274-276, 278-280, 282-284, 286-288, 290-292, 294-296, 298-300, 302-304, 306-308, 310-312, 314, 315, 470, 491, 504, 537, 577, 596, and 601-605 based on lack of written description is reversed.

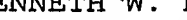
The rejection of claims 117-315 and 457-614 under 35 U.S.C. § 112, first paragraph, based on lack of enablement is reversed.

The rejections of claims 117-315, 457-607, and 610-614 under 35 U.S.C. § 103(a) are reversed.

Appeal No. 2003-0472
Application 08/456,901

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED-IN-PART


KENNETH W. HAIRSTON
Administrative Patent Judge

Lee E. Barrett
LEE E. BARRETT
Administrative Patent Judge

BOARD OF PATENT
APPEALS
AND
INTERFERENCES

Anita Pellman Gross
ANITA PELLMAN GROSS
Administrative Patent Judge

Attachments:

Rob Pike, Graphics in Overlapping Bitmap Layers, Computer Graphics, Vol. 17, No. 3, July 1983, reprinted from acm Trans. on Graphics, April 1983, Vol. 2, No. 2, pp. 331-356.

Mike Tuck, The Real History of the GUI, 16 pages
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Marc Levoy, A Color Animation System Based on the Multiplane Technique, ACM SIGGRAPH Computer Graphics, Proceedings of the 4th annual conference on computer graphics and interactive techniques, Vol. 11, Issue 2, July 1977, pp. 65-71.

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conference on computer graphics and interactive techniques,
Vol. 13, Issue 2, August 1979, pp. 8-13.

Bieneman, U.S. Patent 4,554,538.

Appeal No. 2003-0472
Application 08/456,901

Gilbert P. Hyatt
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Las Vegas, NV 89180

**Ex parte Hyatt, Decision on Appeal No. 2002-1518,
in patent application Serial No. 08/461,567
(PTO Bd. App. May 30, 2003) (unpublished PTO decision)**

The opinion in support of the decision being entered today was not written
for publication and is not binding precedent of the Board.

Paper No. 55

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte GILBERT P. HYATT

Appeal No. 2002-1518
Application No. 08/461,567

HEARD: April 10, 2003

Before HAIRSTON, BARRETT, and GROSS, Administrative Patent Judges.
HAIRSTON, Administrative Patent Judge.

MAILED

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**PAT. & T.M. OFFICE
BOARD OF PATENT APPEALS
AND INTERFERENCES**

734

DECISION ON APPEAL

This an appeal from the final rejection of claims 117 through 190, 193 through 208, 210 through 217, 219 through 324, 341, 342, 344 through 386, 388 through 405 and 407 through 483.

According to the appellant (brief, page 7), "[t]he instant claims are directed to a multiple channel system."

Claims 183, 187 and 280 are illustrative of the claimed invention, and they read as follows:

183. A process comprising the acts of:

generating a first channel of input image information;

generating a second channel of input image information;

generating a first channel of temporally interpolated image information in response to the first channel of input image information;

generating a second channel of temporally interpolated image information in response to the second channel of input image information; and

generating summed image information by summing in response to the first channel of temporally interpolated image information and in response to the second channel of temporally interpolated image information.

187. A process comprising the acts of:

generating input image information;

generating spatially interpolated image information in response to the input image information;

generating a first channel of output image information in response to the spatially interpolated image information;

generating a second channel of output image information in response to the spatially interpolated image information; and

generating combined image information in response to the first channel of output image information and in response to the second channel of output image information.

280. A process comprising the acts of:

generating multiplexed image information;

generating a first channel of demultiplexed image information by demultiplexing in response to the multiplexed image information;

generating a second channel of demultiplexed image information by demultiplexing in response to the multiplexed image information;

generating a first channel of transformed image information in response to the first channel of demultiplexed image information;

generating a second channel of transformed image information in response to the second channel of demultiplexed image information;

generating a first channel of spatially interpolated image information in response to the first channel of transformed image information;

generating a second channel of spatially interpolated image information in response to the second channel of transformed image information; and

generating combined image information in response to the first channel of spatially interpolated image information and in response to the second channel of spatially interpolated image information.

The references relied on by the examiner are:

| | | |
|------------------------------|-----------|---------------|
| Marsh | 4,179,824 | Dec. 25, 1979 |
| Netravali et al. (Netravali) | 4,245,248 | Jan. 13, 1981 |

Claims 117 through 190, 193 through 208, 210 through 217, 219 through 324, 341, 342, 344 through 386, 388 through 405 and 407 through 483 stand rejected under the first paragraph of 35 U.S.C. § 112 for lack of written description.

Claims 117 through 190, 193 through 208, 210 through 217, 219 through 324, 341, 342, 344 through 386, 388 through 405 and 407 through 483 stand rejected under the first paragraph of 35 U.S.C. § 112 for lack of enablement.

Appeal No. 2002-1518
Application No. 08/461,567

Claims 117 through 162, 165 through 190, 193 through 208, 210 through 217, 219 through 324, 341, 342, 344 through 386, 388 through 405 and 407 through 483 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Netravali in view of Marsh.

Reference is made to the briefs (paper numbers 37 and 47) and the answer (paper number 44) for the respective positions of the appellant and the examiner.

OPINION

We have carefully considered the entire record before us, and we will sustain all of the rejections of record.

Turning first to the lack of written description rejection, appellant argues (brief, page 13) that the examiner has not established a prima facie case, and discusses (brief, pages 8 through 10) claims 183, 187 and 280 in connection with this rejection.

According to the examiner (answer, page 12), “[t]he specification is simply an amalgamation of permutations of possibilities of things that might be able to be performed without any details to indicate that Appellant actually had possession of any of the possible systems.” Using claim 280 as an example, the examiner is of the opinion (answer, pages 12 through 14) that “[w]hile there may be mentions of these various elements (or processes) scattered throughout the specification, there is no disclosure of actually combining these disparate items into one complete integrated system as is now being claimed.” With respect to claims 183 and 187, the examiner is of the opinion (answer, pages 14 and 15) that nothing in the specification discloses how to combine the steps into a process

as claimed. The examiner further states (answer, page 16) that “[w]hile many of the individually claimed terms do appear at various places in the original specification, these sections do not reasonably convey to one skilled in the relevant art that Appellant had possession of the claimed invention (specifically the claimed combination of elements) at the time the application was filed.” The examiner concludes (answer, page 17) that the “interconnections and interactions” found in the system and process claims on appeal are lacking in Appellant’s disclosure. In the discussion of the product claims, the examiner notes (answer, page 19) that “[t]here is simply no description in the specification, or any depiction in the drawings, of making these claimed ‘products.’”

Inasmuch as appellant’s specification lacks an embodiment that completely integrates the disparate items or process steps into a self-contained embodiment, we find that the examiner had a reasonable basis for questioning the written description for each of the rejected claims on appeal, and the burden of proof thereafter shifted to appellant. In re Wertheim, 541 F.2d 257, 263, 191 USPQ 90, 97 (CCPA 1976).

The three claims reproduced supra are the only claims on appeal that appellant has read on the disclosure for a showing of written description support (brief, pages 8 through 10). We have reviewed the portions of the drawings and the disclosure suggested by the appellant, and we find that appellant’s disclosure lacks written description support for any type of interpolation at the specifically claimed steps in the noted claims. None of the blocks 110 in Figure 1A, for example, is described in the disclosure as capable of performing interpolation. We find that the disclosure does

mention interpolation¹, but we agree with the examiner (answer, pages 42 through 56) that the disclosure lacks written description support for interpolation in the specifically claimed steps of the claims. Accordingly, the lack of written description rejection of claims 183, 187 and 280 is sustained. The lack of written description rejection of the remainder of the claims on appeal, including the product-related claims², is sustained because appellant has not demonstrated how these claims have such support in the disclosure.

Turning to the lack of enablement rejection, the examiner is of the opinion (answer, pages 23 and 24) that the claims on appeal are directed to subject matter that was not described in the specification in such a way as to enable one skilled in the art to make and/or use the invention without undue experimentation. The examiner states (answer, pages 25 and 26) that appellant has presented a non-enabling disclosure because the various elements discussed in the disclosure are not discussed together in "any single embodiment of the specification or shown in any Figure." The examiner further explains (answer, pages 26 and 27) that:

The rejected claims are directed to systems with individual elements that operate together (as an example, see claim 280 . . .). This is shown by the claim

¹ According to appellant (brief, page 51; reply brief, pages 24 through 29), the specification mentions interpolation more than 100 times.

² The mere mention of products in the specification is not an adequate demonstration by the appellant that he had support in the disclosure on the filing date of the original application for making the products via the claimed processes (brief, pages 57 through 68; reply brief, pages 64 through 69, 99, 100 and 104 through 112).

recitations directed to interconnections and interrelations between the claimed elements . . . that is not supported or described in the originally filed specification. The specification does not contain any disclosure directed to the combination of elements, represented by these claimed interconnections and interrelations. The original specification does not disclose or enable the complete systems that are now being claimed The specification, at best, simply mentions some of the claimed words (or variations thereof) without providing any actual disclosure as to how the elements are to be constructed or how the elements are to be used or how they function, in combination with one another or individually.

In other words, “[t]he interconnections and interactions of the claimed components to perform the claimed functions in combination is lacking from Appellant’s specification” (answer, page 27). As an example, the examiner turns to the claimed “interpolation” in claim 280, and explains that the disclosure does not provide an enabling discussion as to how the claimed “interpolation” fits into the overall claimed process (answer, pages 28 and 29). The examiner concludes with the observation (answer, page 29) that “even if the individual elements were in themselves enabled . . . this would still not provide an enabling disclosure for the claimed combination of elements”

With respect to the product claims on appeal, the examiner states (answer, pages 31 and 32) that:

The specification provides no guidance as to how these products are made or what these products are intended to be. Without any guidance from the originally filed specification, one of ordinary skill in the art would be burdened with undue experimentation or delay in trying to make and use the claimed invention.

Notwithstanding the use of commercially available products and components (brief, pages 75 through 79) and the skill in the art (brief, pages 79 through 82), we are of the opinion that the examiner has established a prima facie case of lack of enablement (brief, pages 82 and 83), and that the appellant has failed to rebut the examiner’s case. If the Office meets its burden, then “the

burden then shifts to the applicant to provide suitable proofs indicating that the specification is indeed enabling.” In re Wright, 999 F.2d 1557, 1561, 27 USPQ2d 1510, 1513 (Fed. Cir. 1993). In view of the foregoing, and the reasoning expressed supra in connection with the written description rejection, we will sustain the lack of enablement rejection.

Turning lastly to the obviousness rejection, appellant argues (brief, page 117) that the examiner has not set forth a prima facie case in spite of the examiner’s explanation (answer, pages 32 through 39) explaining how the teachings of Netravali and Marsh were combined to render obvious the claimed subject matter. If the examiner met the initial burden of presenting a prima facie case of unpatentability, then the burden of coming forward with evidence or argument shifted to the appellant. In re Oetiker, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). To date, appellant has not challenged the propriety of this rejection by demonstrating how individual claims are not rendered obvious by the combined teachings of the references. The mere recitation of claim limitations without any comparison to the applied prior art is not a proper response to an obviousness rejection (brief, pages 127 through 129). Appellant’s hindsight argument (brief, pages 130 through 139) is without merit since the improperly relied on subject matter has not been identified by appellant. The same holds true for appellant’s improper taking of notice argument

Appeal No. 2002-1518
Application No. 08/461,567

(brief, pages 139 through 144) and the non-analogous art argument (brief, pages 147 through 149).

Thus, the obviousness³ rejection is sustained.

DECISION

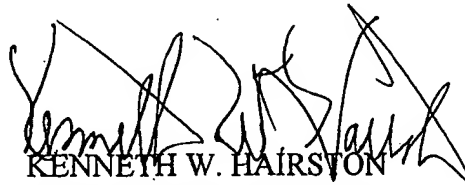
The decision of the examiner rejecting all of the claims on appeal under the written description and the enablement portions of the first paragraph of 35 U.S.C. § 112 is affirmed. The decision of the examiner rejecting claims 117 through 162, 165 through 190, 193 through 208, 210 through 217, 219 through 324, 341, 342, 344 through 386, 388 through 405 and 407 through 483 under 35 U.S.C. § 103(a) is affirmed.

³ Appellant's arguments (brief, pages 150 and 151) to the contrary notwithstanding, the 35 U.S.C. § 103 rejection and the 35 U.S.C. § 112 rejections are not "inconsistent" rejections.

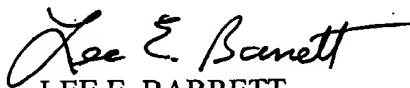
Appeal No. 2002-1518
Application No. 08/461,567

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED



KENNETH W. HAIRSTON
Administrative Patent Judge



LEE E. BARRETT
Administrative Patent Judge



ANITA PELLMAN GROSS
Administrative Patent Judge

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Appeal No. 2002-1518
Application No. 08/461,567

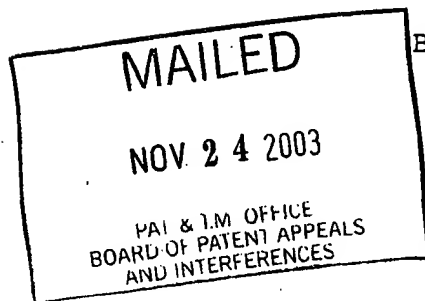
GILBERT P. HYATT
P. O. BOX 81230
LAS VEGAS, NV 89180

**Ex parte Hyatt, Decision on Rehearing, Appeal No. 2002-1518,
in patent application Serial No. 08/461,567
(PTO Bd. App. Nov. 24, 2003) (unpublished PTO decision)**

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 58

UNITED STATES PATENT AND TRADEMARK OFFICE



BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte GILBERT P. HYATT

Appeal No. 2002-1518
Application No. 08/461,567

HEARD: APRIL 10, 2003

Before HAIRSTON, BARRETT, and GROSS, Administrative Patent Judges.

HAIRSTON, Administrative Patent Judge.

ON REQUEST FOR REHEARING

In a decision dated May 30, 2003, the decision of the examiner rejecting all of the claims on appeal under the written description and the enablement portions of the first paragraph of 35 U.S.C. § 112 was affirmed. In addition, the decision of the examiner rejecting nearly all of the claims on appeal under 35 U.S.C. § 103(a) was affirmed.

Appellant now argues (request, pages 1 through 9) that the Board misapprehended or overlooked the fact that Sections 2.4.4 and 2.4.5 in the reply brief provided detailed disclosures of

temporal interpolation and spatial interpolation, respectively, that the geometric modules 110A and 110B (Figure 1A) are taught as implemented with temporal interpolation and that the spacial modules 110E and 110F (Figure 1A) are taught as implemented with spatial interpolation. Appellant's arguments in the request and in the referenced sections of the reply brief to the contrary notwithstanding, we still maintain that "[n]one of the blocks 110 in Figure 1A, for example, is described in the disclosure as capable of performing interpolation" (decision, page 5) as set forth in the sequence of claimed steps. The referenced sections of the reply brief, (i.e., Sections 2.4.4 and 2.4.5) do not associate temporal interpolation with blocks 110A and 110B in Figure 1A, and do not associate spatial interpolation with blocks 110E and 110F in Figure 1A. Although the disclosure mentions temporal interpolation and spatial interpolation, we still agree with the examiner that the originally filed disclosure does not provide written description support for temporal interpolation and spatial interpolation as set forth in the sequence of steps in claims 183, 187 and 280 (decision, pages 5 and 6).

Appellant's argument (request, page 3) that "an artisan would understand that the geometric modules (blocks 110A and 110B in Fig. 1A) are taught as implemented with temporal interpolation

and the spatial modules (blocks 110E and 110F in Fig. 1A) are taught as implemented with spatial interpolation in the 'Experimental System'" is an untimely new argument.

Appellant's argument (request, page 9) that the Board "overlooked the fact that there are several claims which do not even recite interpolation" is also an untimely new argument.

Appellant's arguments (request, pages 8 and 12) concerning "substantial evidence" are not germane to the issues on appeal because "substantial evidence" refers to the standard of review that the U.S. Court of Appeals for the Federal Circuit applies to the Board's factual findings, and not to the examiner's findings. In re Gartside, 203 F.3d 1305, 1315, 53 USPQ2d 1769, 1775 (Fed. Cir. 2000).

In view of the foregoing, we hereby decline appellant's request to change our decision concerning the affirmance of the lack of written description rejection.

Appellant argues (request, pages 10 and 11) that the Board's holding of lack of enablement is inconsistent with the holdings of several prior appeals. In view of our finding of a high level of skill in the art in other related appeals, we agree with the

Appeal No. 2002-1518 "
Application No. 08/461,567

appellant that our reasoning is in conflict with several panel decisions. For this reason, the lack of enablement rejection of all of the claims on appeal is reversed.

Turning lastly to appellant's arguments (request, pages 11 through 15) concerning the Board's affirmance of the obviousness rejection, we still maintain that the examiner established a prima facie case of obviousness (answer, pages 32 through 39). Appellant's specific arguments (request, pages 12 and 13) concerning Marsh and Netravali were not made in the briefs, and are, therefore, considered to be untimely for inclusion in a request for rehearing. In response to appellant's argument (request, page 13) that the brief listed "individual claims and elements in those claims which distinguish over the references . . . , " we still maintain that "[t]he mere recitation of claim limitations without any comparison to the applied prior art is not a proper response to an obviousness rejection" (decision, page 8). Even if we assume for the sake of argument that such a listing minimally qualifies as a patentability argument, the examiner responded to the listing in the brief, and appellant's challenge to the taking of Official Notice by bringing in the

Appeal No. 2002-1518
Application No. 08/461,567

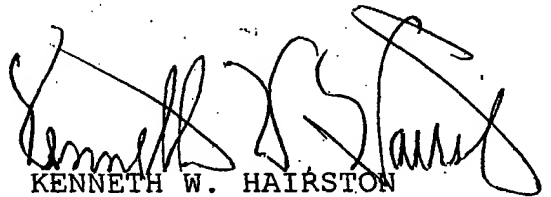
temporal and spatial interpolation teachings in the reference to Taylor (answer, pages 34 and 104). The reply brief did not provide a response to the examiner's reliance on Taylor, and the impact the Official Notice had on other claims of record.

Appellant's request for rehearing has been granted to the extent that our decision has been modified to reverse the lack of enablement rejection of all of the claims on appeal. Our decision to affirm the lack of written description rejection and the obviousness rejection has not been modified.

Appeal No. 2002-1518 "
Application No. 08/461,567

No time period for taking any subsequent action in
connection with this appeal may be extended under 37 CFR
§ 1.136(a).

REHEARING
GRANTED-IN-PART


KENNETH W. HAIRSTON
Administrative Patent Judge)
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LEE E. BARRETT
Administrative Patent Judge)
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ANITA PELLMAN GROSS
Administrative Patent Judge)
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BOARD OF PATENT
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KWH/hh

Appeal No. 2002-1518
Application No. 08/461,567

GILBERT P. HYATT
P.O. BOX 81230
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**Ex parte Hyatt, Decision on Appeal No. 2002-0652,
in patent application Serial No. 08/465,072
(PTO Bd. App. Jun. 30, 2003) (unpublished PTO decision)**

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 56

UNITED STATES PATENT AND TRADEMARK OFFICE

MAILED

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

JUN 3 0 2003

**PAT. & T.M. OFFICE
BOARD OF PATENT APPEALS
AND INTERFERENCES**

Ex parte GILBERT P. HYATT

Appeal No. 2002-0652
Application No. 08/465,072

HEARD: October 22, 2002

Before HAIRSTON,¹ BARRETT, and GROSS, Administrative Patent Judges.
GROSS, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the examiner's final rejection of claims 98 through 102, 104 through 108, 115, 116, 120 through 125, 131 through 141, 143 through 147, 154, 155, 161 through 164, 170, 171, 175 through 195, 204 through 206, 211 through 219, 227 through 254, 263 through 265, 273 through 278, 286 through 288, 297 through 304, 307, 310, 311, 314, 317, 320, 323, 324, 327, 330, 331, 334, 336 through 338, 341 through 346,

¹ For purposes of rendering a decision herein, Administrative Patent Judge Hairston has been substituted for Administrative Patent Judge Lall, who has retired since the date of the hearing. *See In re Bose Corp.*, 772 F.2d 866, 227 USPQ 1 (Fed. Cir. 1985) and MPEP § 1203. See also Paper No. 47.

349, 351 through 353, 356 through 361, 364, 366 through 368, 371, 374 through 377, 379, 382, 384, 389, 390, and 392 through 395.

According to appellant (Brief, page 7), "[t]he instant claims are directed to a display invention having novel processing including temporal interpolation, undersampling, and spatial interpolation." Claims 105, 177, 190, and 191 are illustrative of the claimed invention, and they read as follows:

105. A system comprising:

a memory storing input image information;

an undersampling circuit coupled to the memory and generating undersampled image information by undersampling the input image information stored in the memory;

a spatial interpolation circuit coupled to the undersampling circuit and generating spatially interpolated image information in response to the undersampled image information generated by the undersampling circuit; and

a temporal interpolation circuit coupled to the spatial interpolation circuit and generating temporally interpolated image information in response to the spatially interpolated image information generated by the spatial interpolation circuit.

177. A process comprising the acts of:

storing in a first memory input image information;

generating output spatially filtered image information in response to the input image information;

inputting spatially filtered image information into a second memory in response to the output spatially filtered image information, the second memory storing the spatially filtered image information;

generating undersampled image information by undersampling the spatially filtered image information;

Appeal No. 2002-0652
Application No. 08/465,072

generating spatially interpolated image information in response to the undersampled image information;

generating temporally interpolated image information in response to the spatially interpolated image information;

communicating output image information in response to the temporally interpolated image information;

generating display image information in response to the temporally interpolated image information; and

displaying an image in response to the display image information.

190. A process comprising the acts of:

storing in a first memory input image information;

generating undersampled image information by undersampling the input image information;

generating spatially interpolated image information in response to the undersampled image information; and

generating temporally interpolated image information in response to the spatially interpolated image information.

191. A process as set forth in claim 190, further comprising the act of:

communicating output image information in response to the temporally interpolated image information.

No prior art references of record have been relied upon by the examiner in rejecting the appealed claims.

The examiner on page 5 of the Answer withdrew all rejections in this application except for the following:

Claims 98 through 102, 104 through 108, 115, 116, 120 through 125, 131 through 141, 143 through 147, 154, 155, 161

Appeal No. 2002-0652
Application No. 08/465,072

through 164, 170, 171, 175 through 195, 204 through 206, 211 through 219, 227 through 254, 263 through 265, 273 through 278, 286 through 288, 297 through 304, 307, 310, 311, 314, 317, 320, 323, 324, 327, 330, 331, 334, 336 through 338, 341 through 346, 349, 351 through 353, 356 through 361, 364, 366 through 368, 371, 374 through 377, 379, 382, 384, 389, 390, and 392 through 395 stand rejected under 35 U.S.C. § 112, first paragraph, as being based upon a lack of written description and also as being based on a lack of enabling disclosure.²

Reference is made to the Examiner's Answer (Paper No. 48, mailed September 24, 2001) for the examiner's complete reasoning in support of the rejections, and to appellant's Appeal Brief (Paper No. 41, filed June 30, 2000), Supplemental Appeal Brief (Paper No. 46, filed January 8, 2001), Errata to the Appeal Brief and Supplemental Appeal Brief (Paper No. 51, filed February 2, 2001), and Reply Brief (Paper No. 52, filed November 26, 2001) for appellant's arguments thereagainst.

OPINION

As a preliminary matter, we note that appellant states on page 9 of the Appeal Brief that the claims do not stand or fall

² We note that although the examiner includes claims 196 through 199, 207 through 210, 255 through 258, 305, 318, 332, 335, 347, 350, 362, 365, 383, and 386 in the statement of the rejection, appellant states on pages 8-9 of the supplemental appeal brief that these claims are among those not appealed.

Appeal No. 2002-0652.
Application No. 08/465,072

together. Appellant further states (id.) that the claims are separately argued. However, section 8.9 of the Supplemental Brief entitled "Separate Arguments for Separate Patentability of each Claim Regarding § 112-1, § 103, and Double Patenting" merely recites the claim limitations for each claim and concludes for each claim that "the § 112-1 rejections do not establish why the express disclosure of the limitations in this claim does not satisfy § 112-1 (see Sections 8.1-8.3 and particularly the TABLE OF TERMINOLOGY OCCURRENCES)." 37 C.F.R. § 1.192(c)(7) states:

For each ground of rejection which appellant contests and which applies to a group of two or more claims, the Board shall select a single claim from the group and shall decide the appeal as to the ground of rejection on the basis of that claim alone unless a statement is included that the claims of the group do not stand or fall together and, in the argument under paragraph (c)(8) of this section, appellant explains why the claims of the group are believed to be separately patentable. *Merely pointing out differences in what the claims cover is not an argument as to why the claims are separately patentable.* (Emphasis ours)

Thus, notwithstanding appellant's assertions to the contrary (Reply Brief, pages 1-4), appellant has provided no separate arguments in accordance with 37 C.F.R. § 1.192(c)(7).

The only place appellant separately treats any of the claims is in the Summary of the Supplemental Appeal Brief, wherein appellant reads claims 105, 177, 190, and 191 on the disclosure. Appellant argues (Reply Brief, pages 80-81) that the examiner misrepresents this reading of claims 105, 177, 190, and 191 on

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the disclosure as evidence of meeting 35 U.S.C. § 112, first paragraph. 37 C.F.R. § 1.192(c)(8)(i) states:

(i) For each rejection under 35 U.S.C. § 112, first paragraph, the argument shall specify the errors in the rejection and how the first paragraph of 35 U.S.C. § 112 is complied with, including, as appropriate, how the specification and drawings, if any,

(A) Describe the subject matter defined by each of the rejected claims.

Thus, the rule requires appellant to read the claims on the disclosure. Since the only place that appellant reads any claims on the disclosure is in the Summary of the Supplemental Appeal Brief, the examiner correctly took the reading of claims 105, 177, 190, and 191 as specific arguments according to 37 C.F.R. § 1.192(c)(7) and (c)(8). We note that appellant does set forth a number of arguments regarding the product claims, treating all of the product claims as a single group. Accordingly, we shall decide the appeal on the basis of claims 105, 177, 190, and 191, as well as claim 178 (as representative of the product claims), with the remaining claims standing or falling therewith.

We have carefully considered the claims and the respective positions articulated by appellant and the examiner. As a consequence of our review, we will affirm the written description rejection of claims 98 through 102, 104 through 108, 115, 116, 120 through 125, 131 through 141, 143 through 147, 154, 155, 161 through 164, 170, 171, 175 through 195, 204 through 206, 211

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through 219, 227 through 254, 263 through 265, 273 through 278, 286 through 288, 297 through 304, 307, 310, 311, 314, 317, 320, 323, 324, 327, 330, 331, 334, 336 through 338, 341 through 346, 349, 351 through 353, 356 through 361, 364, 366 through 368, 371, 374 through 377, 379, 382, 384, 389, 390, and 392 through 395 and reverse the enablement rejection of the same claims.

35 U.S.C. § 112, First Paragraph, Written Description Rejection

According to the examiner (Answer, pages 11-12):

The specification is simply an amalgamation of permutations of possibilities of things that might be able to be performed without any details to indicate that Appellant actually had possession of any of the possible systems. Nowhere in the lengthy specification does Appellant actually describe a complete and functioning system that would correspond to the claimed subject matter.

The examiner states (Answer, pages 12-13) that the claims are directed to combinations of "undersampling," "temporal interpolation," "spatial interpolation," and "spatial filtering" of image information, all of which are mentioned throughout the specification. However, according to the examiner, "there is no disclosure of actually combining these disparate items into one complete integrated system as is now being claimed." Stated another way (Answer, page 15), "[w]hile many of the individually claimed terms do appear at various places in the original specification, these sections do not reasonably convey to one

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skilled in the relevant art that Appellant had possession of the claimed invention (specifically the claimed combination of elements) at the time the application was filed." The examiner concludes (Answer, page 16) that the "interconnections and interactions of the claimed components to perform the claimed functions in combination is lacking from Appellant's specification."

Appellant sets forth numerous general arguments not directed to any particular claims or claim elements. Basically, we are not persuaded by such general arguments about what the examiner should have done, about perceived inconsistencies in the rejection, and boilerplate statements of the law. What is important is the merits of the particular written description and enablement rejections. Nonetheless, as the majority of all of the Briefs is directed to such generalities, we begin by addressing some of the most prevalent general arguments. Then we will address appellant's reading on the disclosure of the four claims reproduced *supra*.

Appellant's General Arguments

Appellant argues (Brief, page 10) that the rejections under 35 U.S.C. § 112, first paragraph, are non-critical "technical" rejections and are "clearly improper." However, section 112 is a statutory requirement of patentability which cannot be ignored.

Appellant contends (Brief, pages 11-14, and Reply Brief, pages 78-80 and 108-109) that the § 112 rejections are based on disclosed but unclaimed subject matter. Appellant refers to the examiner's discussion of terms such as "can be" and "may be" in the disclosure. Appellant has taken this discussion out of context. The examiner merely points out such terms as evidence that the disclosure is unclear as to how the elements actually **are** connected.

Appellant (Brief, pages 14-16 and 23-26, and Reply Brief, pages 11-12 and 107-108) asserts that the examiner has not considered the disclosure as a whole, pointing to "the large number of recitations of the claim terminology in the specification" (Brief, page 15). Appellant (Brief, page 15, and Reply Brief, page 9) directs our attention to the Table of Terminology Occurrences. However, merely pointing to isolated words scattered throughout the specification does not describe the invention claimed as a combination of elements, functions, and interconnections, any more than a dictionary provides written description support for a book where words are used in combination to provide a certain meaning. That various words appear several times does not speak to how the elements are connected nor how they function together.

In a related argument, appellant insists (Brief, pages 56-58) that the examiner requires *verbatim* recitation of terminology, which is contrary to the law. Nevertheless, it is argued (Brief, page 56, and Reply Brief, pages 22-23) that "there is significant verbatim and literal claim terminology in the disclosure." The examiner does *not* require *in haec verba* (verbatim) support for the claimed subject matter at issue. The examiner properly requires appellant to show written description support for the claim limitation as a whole and not just for isolated words of the limitation spread out over the specification.

Appellant argues (Supplemental Appeal Brief, pages 21-30, and Reply Brief, pages 6-7 and 83) that the examiner's rejections are not supported by "substantial evidence." "Substantial evidence" is the standard of review that the U.S. Court of Appeals for the Federal Circuit applies to the Board's factual findings, *see In re Gartside*, 203 F.3d 1305, 1315, 53 USPQ2d 1769, 1775 (Fed. Cir. 2000), not to the Board's review of the examiner's findings, as argued by appellant. We review the examiner's findings based on the evidence in the examiner's rejection and appellant's arguments about the errors in the rejection as required by 37 C.F.R. § 1.192(c)(8). However, we are not precluded from relying on other evidence from our own

review of the record since it is the facts in our decision that will be reviewed for "substantial evidence."

Appellant (Reply Brief, pages 8-9 and 65-67) argues that the examiner's rejection does not construe the claims as required by *Gechter v. Davidson*, 116 F.3d 1454, 43 USPQ2d 1030 (Fed. Cir. 1997). The courts review an adverse decision of the Board, 35 U.S.C. §§ 141 and 145, not the examiner's rejection. The central thrust of *Gechter* is that the Board must explain the basis for its rulings sufficiently to enable meaningful judicial review. *See In re Hyatt*, 211 F.3d 1367, 1371, 54 USPQ2d 1664, 1666 (Fed. Cir. 2000). *Gechter* does not require that claims always be construed. Express claim construction is only required where the scope and meaning of limitations are in question. It is unnecessary and impractical to expressly interpret every claim limitation in every claim when there is no question as to what is meant. The examiner did not err by giving the claim limitations their ordinary meaning and by not expressly construing each claim limitation. Moreover, appellant merely alleges that the claims have to be construed without saying how the claim construction would affect the rejections. Clearly, this is a "boilerplate" procedural attack that is not tied to the actual rejections.

Appellant concludes (Brief, pages 41-44) that the written description rejections do not establish a *prima facie* case,

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because the examiner has provided no proper explanation or reasoning regarding the adequacy of the disclosure, and the rejections "appear to be objections to the form and style of the disclosure" rather than the content. Appellant has ignored the examiner's clear explanation on pages 8-16 of the Answer of how the disclosure is broken up into numerous sections, each related to a portion of the invention, with no teachings as to how the various portions are connected to each other and function in response to one another, as recited in the claims. Further, the examiner describes on pages 16-21 of the Answer the lack of any disclosure of the claimed products and the steps of making them, as recited in the claims. Therefore, the examiner has provided reasoning regarding the adequacy of the disclosure.

Appellant states (Brief, pages 16-17) that the disclosure is "legally correct and presumptively valid," since the examiner has failed to present objective reasons to overcome the presumption. The examiner has presented a clear explanation as to what claim limitations he finds to be lacking from the disclosure. The written description rejection under 35 U.S.C. § 112, first paragraph, is used to reject when a claim is amended to recite elements thought to be without support in the original disclosure. *See In re Rasmussen*, 650 F.2d 1212, 1214-15, 211 USPQ 323, 326 (CCPA 1981). The test for written description is

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summarized in *Purdue Pharma L.P. v. Faulding Inc.*, 230 F.3d 1320, 1323, 56 USPQ2d 1481, 1483 (Fed. Cir. 2000):

In order to satisfy the written description requirement, the disclosure as originally filed does not have to provide *in haec verba* support for the claimed subject matter at issue. *See Fujikawa v. Wattanasin*, 93 F.3d 1559, 1570, 39 USPQ2d 1895, 1904 (Fed. Cir. 1996). Nonetheless, the disclosure "must ... convey with reasonable clarity to those skilled in the art that ... [the inventor] was in possession of the invention." *Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1563-64, 19 USPQ2d 1111, 1117 (Fed. Cir. 1991). Put another way, one skilled in the art, reading the original disclosure, must "immediately discern the limitation at issue" in the claims. *Waldemar Link GmbH & Co. v. Osteonics Corp.*, 32 F.3d 556, 558, 31 USPQ2d 1855, 1857 (Fed. Cir. 1994). That inquiry is a factual one and must be assessed on a case-by-case basis. *See Vas-Cath*, 935 F.2d at 1561, 19 USPQ2d at 1116 ("Precisely how close the original description must come to comply with the description requirement of § 112 must be determined on a case-by-case basis.").

Because the sufficiency of the written description is evaluated by one of ordinary skill in the art, details that would be known by the skilled artisan need not be included in a patent specification. *See Hyatt v. Boone*, 146 F.3d 1348, 1353, 47 USPQ2d 1128, 1131 (Fed. Cir. 1998). However, when an explicit limitation in a claim is not present in the written description, the burden is on the applicant to show that a person of ordinary skill in the art would have understood that the description necessarily includes that limitation. *Cf. id.* at 1354-55, 47 USPQ2d at 1132 ("Thus, the written description must include all of the

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limitations of the interference count, or the applicant must show that any absent text is necessarily comprehended in the description provided and would have been so understood at the time the patent application was filed." (Emphasis added.)). "One shows that one is 'in possession' of *the invention* by describing *the invention*, with all of its claimed limitations, not that which makes it obvious." *Lockwood v. American Airlines Inc.*, 107 F.3d 1565, 1572, 41 USPQ2d 1961, 1966 (Fed. Cir. 1997). The written description requirement is not satisfied if the disclosure would lead one to speculate as to "modifications that the inventor might have envisioned, but failed to disclose." *Id.*

The U.S. Patent and Trademark Office (USPTO) bears the initial burden of presenting a *prima facie* case of unpatentability. The burden regarding the written description requirement is described in *In re Alton*, 76 F.3d 1168, 1175, 37 USPQ2d 1578, 1583 (Fed. Cir. 1996):

Insofar as the written description requirement is concerned, that burden is discharged by "presenting evidence or reasons why persons skilled in the art would not recognize in the disclosure a description of the invention defined by the claims." *Wertheim*, 541 F.2d at 263, 191 USPQ at 97. Thus, the burden placed on the examiner varies, depending upon what the applicant claims. If the applicant claims embodiments of the invention that are completely outside the scope of the specification, then the examiner or Board need only establish this fact to make out a *prima facie* case. *Id.* at 263-64, 191 USPQ at 97. If, on the other

hand, the specification contains a description of the claimed invention, albeit not *in ipsius verbis* (in the identical words), then the examiner or Board, in order to meet the burden of proof, must provide reasons why one of ordinary skill in the art would not consider the description sufficient. *Id.* at 264, 191 USPQ at 98. Once the examiner or Board carries the burden of making out a *prima facie* case of unpatentability, "the burden of coming forward with evidence or argument shifts to the applicant." *Oetiker*, 977 F.2d at 1445, 24 USPQ2d at 1444.

The burden of establishing a *prima facie* case should consider that it is extremely difficult to prove that there is no written description support for claim limitations (i.e., to prove a negative), especially where, as here, the disclosure includes 576 pages of specification and 66 pages of drawing figures, whereas it is trivial for appellant, who drafted both the specification and claims, to point out support for the elements, steps, and interconnections recited in the claims.

Appellant argues (Reply Brief, pages 84-90) that the examiner "is attempting to recast written description to require more details than required to meet the enablement requirement" (*Id.* at 84). Appellant quotes the PTO Guidelines for the written description requirement that "each claim limitation must be expressly, implicitly, or inherently supported in the originally filed disclosure," emphasizing the phrase "each claim limitation." Appellant goes on to explain that the requirement is satisfied because the claim limitations are recited *verbatim*

or near *verbatim* in the disclosure. The claim limitations referenced by appellant are the individual elements. However, the claimed interconnections, established by the "in response to" language, are claim limitations as well, and appellant appears to disregard these interconnections as claim limitations.

On pages 15-16 of the Supplemental Appeal Brief and 12-16 of the Reply Brief, appellant argues that the examiner disregards the reduced-to-practice "Experimental System." Further, appellant asserts (Reply Brief, pages 16-32) that the disclosure provides legal "examples" of computer programs for many of the claim limitations. On pages 23-60 of the Reply Brief, appellant argues that the reduced-to-practice computer programs provide working examples of various claimed elements such as temporal interpolation (referring to specification pages 248-292, 435-438, and 567-574), spatial interpolation (referring to specification pages 31-37, 146-150, 164-168, 240-373, and 503-574), undersampling (referring to specification pages 53, 57, 90, and 378), and filtering (referring to specification pages 29, 33, 64, 69, and 169). The rejection states (Answer, page 13) that "[w]hile there may be mentions of these various elements (or processes) scattered throughout the specification, there is no disclosure of actually combining these disparate items into one complete integrated system as is now being claimed." Appellant's

arguments do not address the lack of interconnections, but rather focus on individual elements. Furthermore, the disparate pages referenced by appellant in pointing to the support for the various elements evidence that the disclosure fails to tie all the elements together in the manner claimed.

Appellant argues (Reply Brief, pages 67-77) that the examiner has misrepresented the disclosure, disregarding elements that are relevant to the claimed interconnections. Appellant reproduces portions of the disclosure to support this position. However, the reproduced sections do not indicate exactly how the various claimed elements are interconnected.

Appellant contends (Reply Brief, pages 90-97 and 106) that the examiner's written description rejection is really an enablement issue as the interconnections deal with how to make the invention. The claim language "in response to" establishes certain interconnections between the claimed elements, and those interconnections need support in the disclosure. If the elements are disclosed, but with no particular configuration, or in a different configuration than what is claimed, then there is no written description. There may be an enablement issue as well, but the examiner is correct in rejecting the claims under the written description portion of § 112, first paragraph.

Appellant's arguments specific to claims 105, 177, 190, and 191

We first note that appellant points to several pages scattered throughout the 576 page specification to show support for the four claims. Appellant also directs our attention to numerous drawings for the various claim limitations, rather than a single drawing that shows all of the limitations. Although there is no requirement that a claim be limited to a single drawing, the court has said "one skilled in the art, reading the original specification, must "immediately discern the limitation at issue" in the claims. *Waldemar Link GmbH & Co. v. Osteonics Corp.*, 32 F.3d 556, 558, 31 USPQ2d 1855, 1857 (Fed. Cir. 1994). When several elements are claimed with interconnections therebetween, clearly the most straightforward way to immediately discern the limitations would be for them to be shown in a single drawing, or a couple of drawings where the relationship between them is clearly indicated. With that said, we now turn to appellant's reading of the claims.

Claim 105 recites (1) a memory storing input image information, (2) (a) an undersampling circuit (b) coupled to the memory, (3) (a) a spatial interpolation circuit (b) coupled to the undersampling circuit and generating information in response to the undersampled image information, and (4) (a) a temporal interpolation circuit (b) coupled to the spatial interpolation

circuit and generating information in response to the spatially interpolated image information. Claim 190 is a process which parallels claim 105, reciting (1) storing input image information in a memory, (2)(a) undersampling (b) the input image information, (3)(a) generating spatially interpolated image information (b) in response to the undersampled image information, and (4)(a) generating temporally interpolated image information (b) in response to the spatially interpolated image information.

Appellant directs us, for example, to image memory 111(c) (which is part of the geometric module 110A) of Figure 1C, image memory 120D of Figure 1H, or image memory 131D of Figure 1J for the claimed memory. Therefore, we find support for the image memory of claim 105 and the step of storing in the image memory of claim 190.

The undersampling circuit and corresponding process step, according to appellant, is also part of the geometric module 110A. The portions of the specification referenced by appellant explain that spatial compression and decompression can be performed by undersampling an input array in the input memory. Therefore, the step of undersampling the input image information of claim 190 and the coupling to the image memory of claim 105 appears to be supported by the disclosure. No undersampling

circuit is shown in any of the drawings nor do any of the referenced portions of the disclosure clearly indicate what elements correspond to the undersampling circuit. Nonetheless, the discussion on pages 102-105 of undersampling in conjunction with compression is in the section of the specification entitled "Geometric Processor." Thus, the undersampling circuit would appear to be within the geometric module, as asserted by appellant.

Appellant points to spatial module 110E in Figure 1A for the spatial interpolation circuit and step of generating spatially interpolated information. Spatial module 110E follows the geometric module, and thus would appear to function "in response to" the undersampling circuit which is within the geometric module. However, many of the portions of the specification referenced by appellant for a discussion of interpolation are under the heading of "Geometric Processor." Thus, it is unclear if the spatial interpolation circuit is "coupled to the undersampling circuit" and functions "in response to the undersampled image information" and whether the spatial interpolation step is "in response to the undersampled image information."

Last, for temporal interpolation, appellant directs us, for example, to both element 110A and also element 110R in Figure 1A.

None of the drawings explicitly show a temporal interpolation circuit. Although line 110H in Figure 1A could be considered to take the image information generated by the spacial module for further processing by the geometric module 110A, it is unclear how element 110R would act "in response to" the image information output by the spacial module. Furthermore, none of the blocks 110 in Figure 110A, for example, is described in the disclosure as capable of performing interpolation. The disclosure does define temporal interpolation as generating initial conditions for each field (see page 248 and 258), distinguishes between temporal and spatial interpolation (see page 248), and describes an interpolation routine (see pages 269-278 and 281-282), but does not support a temporal interpolation circuit functioning in response to spatially interpolated image information or a temporal interpolation step in response to spatially interpolated image information. Accordingly, we agree with the examiner that the disclosure lacks written description support for claims 105 and 190.

Claim 191 adds a step to the end of the process of claim 191. As we found no written description support for claim 190, we likewise find no such support for claim 191. Similarly, claim 177 is similar to claim 190 except that it includes further steps between the step of storing input image information and the step

of generating undersampled image information and also adds steps following the step of generating temporally interpolated image information. As we found no written description support for claim 190, we also find no such support for claim 177.

Consequently, the lack of written description rejection of claims 105, 177, 190, and 191 is sustained. Claims 178-189, 192, 195, 206, 213, 216, 219, 229, 232, 235, 237-248, 251, 254, 265, 275, 278, 285, 288, 303, 304, 307, 310, 311, 314, 317, 320, 323, 324, 327, 330, 331, 334, 336 through 338, 341 through 346, 349, 351 through 353, 356 through 361, 364, 366 through 368, 371, 374 through 377, 379, 382, 384, 389, 390, and 393 through 395, the "product claims," are dealt with below. The lack of written description rejection of the remainder of the claims on appeal is sustained because appellant has not demonstrated how these claims have such support in the disclosure.

Appellant's arguments as to the product claims³

The examiner finds no written description support for the "making a product" limitations (Answer, pages 16-21). An exemplary "making a product" limitation is claim 178: "A process

³ As indicated *supra*, the product claims are claims 178-189, 192, 195, 206, 213, 216, 219, 229, 232, 235, 237-248, 251, 254, 265, 275, 278, 285, 288, 303, 304, 307, 310, 311, 314, 317, 320, 323, 324, 327, 330, 331, 334, 336 through 338, 341 through 346, 349, 351 through 353, 356 through 361, 364, 366 through 368, 371, 374 through 377, 379, 382, 384, 389, 390, and 393 through 395.

as set forth in claim 177, further comprising the act of: making a product in response to the temporally interpolated image information." The examiner explains (Answer, page 18) that there is no disclosure of "what the products are, how they are made, and how such product claims should be interpreted." The examiner continues that "[p]articularly, there is no description of making the claimed 'products' in response to the limitations of other claims."

The step of "making a product" is an additional step (as indicated by the limitations "further comprising" and "in response to"). Thus, the product is not the end result of the process, but is the result of some additional "making" step. The specification does not describe the "product" that is made or the additional "making step." Certainly, the specification does not describe making anything tangible in the way of hardware. There is no reason why appellant cannot specifically describe and name what is being made instead of using the generic term "product." The descriptions of "products" in the specification have nothing to do with the claimed products, but deal with such things as the result of a multiplication operation. Although the disclosure describes hardware (computers, memory chips, etc.) which are products, this hardware does not fit the claimed product which is made in response to information. Appellant does not inform us

what he means by the "product" or "making" step; instead, he leaves it for us to guess at what is intended. While in some cases examiners may guess at what is meant by "products," the disclosure should speak for itself. Thus, there is a *prima facie* case of lack of written description.

Appellant (Reply Brief, pages 99-104) points to particular occurrences in the specification of terminology, such as "oil," "mineral," and "vehicle" as support for the claimed oil, mineral, and vehicle products. The skilled artisan would consider an oil product to refer to something produced from oil and a vehicle product to refer to something produced by a vehicle. The referenced portions, though, merely state that the invention may be used by companies involved in fields dealing with oil and minerals or as a display for a vehicle; they do not clearly define, for example, an "oil product," a "mineral product," or a "vehicle product." Thus, the referenced portions of the disclosure do not answer the question as to what the various products are. Further, the cited portions of the specification provide no indication as to what the additional "making steps" would be.

Appellant argues (Brief, pages 26-30, and Reply Brief, pages 60-61) that the § 112, first paragraph, rejections regarding product terminology are improper because 35 U.S.C. § 271(g)

expressly provides protection of a "product" made by the claimed process and covers "products" even without reciting "product" terminology.

Section 271(g) excludes others from using or selling throughout the United States, or importing into the United States, products made by a patented process. The "products" in § 271(g) refer to the clearly identified end products of a manufacturing process, such as a particular chemical produced by a chemical process. That is, the patent claims would recite a process for making a specific named machine, manufacture, or composition of matter and would not just recite a "product" without saying what it is. Section 271(g) does not answer the question of where the present specification describes what the product is or where it describes making the undescribed product as an additional step after the end of the process. The "making a product" claims do not recite that the product is what is made by the process of the independent claim as argued by appellant. The issue is not whether the term "product" is found somewhere in the patent statute, or whether the result of a process is always a "product," but whether there is written description support for the additional step of "making a product," in particular, for what the "product" is, and how it is "made." If appellant is somehow arguing that § 271(g) allows claims using the generic

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term "product" without disclosing what the product is or how it is made, this is error. Section 271(g) is an infringement provision and has nothing to do with claiming.

Appellant argues (Brief, page 30) that the § 112, first paragraph, rejections, regarding product terminology are in conflict with the law of the Court of Customs and Patent Appeals (CCPA) and, hence, the Federal Circuit, which states that an invention can be claimed both as a "process" and a "product," so it is clearly permitted to claim both the process and the further act of making a product in response to the process or as a step in the process.

This argument simply does not address the rejection. The "making a product" claims do not recite that the product is what is made by the process of the independent claim, but recite a product made by an additional step, where there is no written description of the "product" or the step of "making." Appellant has not identified what he means by the product. Furthermore, it is not just what appellant intends, but what the disclosure objectively teaches one of ordinary skill in the art.

Appellant argues (Brief, pages 29-30) that products include "machines" and "manufactures" and that clearly the disclosed apparatuses constitute "machines" and "manufacture" and, hence, products. It is also argued that the disclosed signals

constitute "manufactures" (and hence "products") because the signals are physical things made by the disclosed circuits.

The three product classes of statutory subject matter under 35 U.S.C. § 101 (machine, manufacture, and composition of matter) have traditionally required physical structure or matter. While the specification discloses things, such as computers, memory chips, wires, etc., which are products, the claim language does not read on these things. No tangible physical structure is made in response to information as recited in the claims. We also disagree with the argument that "signals" are a "manufacture" and hence a product. A signal, while physical in the sense that it can be measured, does not have a tangible physical structure and does not fall within any of the statutory categories. *See In re Bonczyk*, No. 01-1061 (Fed. Cir. May 11, 2001) (unpublished).

("fabricated energy structure" does not correspond to any statutory category of subject matter and it is unnecessary to reach the alternate ground of affirmance that the subject matter lacks practical utility). A "composition of matter" "covers all compositions of two or more substances and includes all composite articles, whether they be results of chemical union, or of mechanical mixture, or whether they be gases, fluids, powders or solids." *Shell Development Co. v. Watson*, 149 F. Supp. 279, 280, 113 USPQ 265, 266 (D.D.C. 1957), *aff'd*, 252 F.2d 861, 116 USPQ

428 (D.C. Cir. 1958). "A signal is not matter, but is a form of energy, and therefore is not a composition of matter or product.

"The term machine includes every mechanical device or combination of mechanical powers and devices to perform some function and produce a certain effect or result." *Corning v. Burden*, 56 U.S. (15 How.) 252, 267 (1854); *see also Burr v. Duryee*, 68 U.S. (1 Wall.) 531, 570 (1863) (a machine is a concrete thing, consisting of parts or of certain devices and combinations of devices). A modern definition of machine no doubt includes electronic devices which perform functions. Indeed, devices such as flip-flops and computers are referred to in computer science as sequential machines. A signal, while physical, has no concrete tangible physical structure, and does not itself perform any useful, concrete and tangible result; thus, a signal does not fit within the definition of a machine (or product).

The Supreme Court has read the term "manufacture" in accordance with its dictionary definition to mean "the production of articles for use from raw or prepared materials by giving to these materials new forms, qualities, properties, or combinations, whether by hand-labor or by machinery." *Diamond v. Chakrabarty*, 447 U.S. at 308, 206 USPQ at 196-97 (quoting *American Fruit Growers, Inc. v. Brogdex Co.*, 283 U.S. 1, 11,

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8 USPQ 131, 133 (1931)), which, in turn, quotes the *Century Dictionary*). Other courts have applied similar definitions. *See American Disappearing Bed Co. v. Arnaelsteen*, 182 F. 324, 325 (9th Cir. 1910), *cert. denied*, 220 U.S. 622 (1911). These definitions require physical substance, which a signal does not have. Accordingly, we conclude that a signal is not a product.

Appellant argues (Brief, pages 30-31) that claims reciting "making a product" have already been issued in ancestor Patent No. 5,584,032, that the claims in that patent have a presumption of validity, and since the present disclosure is the same as the disclosure in that patent, it must be accepted that there is written description for the terminology in this application. Likewise, appellant argues (Supplemental Appeal Brief, pages 17-18, and Reply Brief, pages 61-65, 97-98, and 105) that the examiner admitted in copending applications that "such product-related terminology was obvious in view of the prior art without the benefit of the instant disclosure" and, therefore, "cannot now contend that such product-related claim limitations are insufficiently disclosed" (Reply Brief, page 65).

That other patents have been issued with similar language does not mean that that language is correct and does not control the outcome of this case. *See In re Riddle*, 438 F.2d 618, 620,

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169 USPQ 45, 47 (CCPA 1971) ("two wrongs cannot make a right").

The same applies to an examiner's actions in other cases.

Appellant contends (Brief, pages 31-37) that the disclosure recites ample product related terminology, such as "constructed," "manufactured," "implemented," "interconnected," etc. These terms deal with the apparatus and have not been shown to be relevant to the claimed process limitation of "making a product."

Appellant argues (Brief, pages 37-41) that the claimed products have antecedent basis in the ancestor patents that are incorporated-by-reference. Again, appellant points to no specific portion that discloses the claimed products and the steps of making them, as recited in the various claims. Consequently, the lack of written description rejection of the product claims, claims 178-189, 192, 195, 206, 213, 216, 219, 229, 232, 235, 237-248, 251, 254, 265, 275, 278, 285, 288, 303, 304, 307, 310, 311, 314, 317, 320, 323, 324, 327, 330, 331, 334, 336 through 338, 341 through 346, 349, 351 through 353, 356 through 361, 364, 366 through 368, 371, 374 through 377, 379, 382, 384, 389, 390, and 393 through 395, is sustained.

35 U.S.C. § 112, First Paragraph, Enablement Rejection

The examiner is of the opinion (Answer, pages 21-22) that the claims on appeal are directed to subject matter that was not

described in the specification in such a way as to enable one skilled in the art to make and/or use the invention without undue experimentation. The examiner asserts (Answer, page 24) that appellant has presented a non-enabling disclosure because the various elements discussed in the disclosure are not discussed together in "any single embodiment of the specification or shown in any Figure." The examiner further explains (Answer, page 24):

The rejected claims are directed to systems with individual elements that operate together (as an example, see claim 105 . . .). This is shown by the claim recitations directed to interconnections and interrelations between the claimed elements . . . that is not supported or described in the originally filed specification. The specification does not contain any disclosure directed to the combination of elements, represented by these claimed interconnections and interrelations. The original specification does not disclose or enable the complete systems that are now being claimed. . . . The specification, at best, simply mentions some of the claimed words (or variations thereof) without providing any actual disclosure as to how the elements are to be constructed or how the elements are to be used or how they function, in combination with one another or individually.

In other words, "[t]he interconnections and interactions of the claimed components to perform the claimed functions in combination is lacking from Appellant's specification" (Answer, page 25).

"The test of enablement is whether one reasonably skilled in the art could make or use the invention from the disclosures in the patent coupled with information known in the art without

undue experimentation." *United States v. Teletronics, Inc.*, 857 F.2d 778, 785, 8 USPQ2d 1217, 1223 (Fed. Cir. 1988). The factors to be considered in determining whether a disclosure would require "undue experimentation" are summarized in *In re Wands*, 858 F.2d 731, 737, 8 USPQ2d 1400, 1404 (Fed. Cir. 1988). The *Wands* factors "are illustrative, not mandatory. What is relevant depends on the facts." *Amgen, Inc. v. Chugai Pharm. Co., Ltd.*, 927 F.2d 1200, 1213, 18 USPQ2d 1016, 1027 (Fed. Cir. 1991). The enablement requirement is separate and distinct from the written description requirement of § 112, first paragraph. *See Vas-Cath, Inc. v. Mahurkar*, 935 F.2d at 1563, 19 USPQ2d at 1117. A specification may enable one skilled in the art to make and use an invention and yet still not describe it. *Id.* at 1561, 19 USPQ2d at 1115.

It appears that the examiner's position is that since there is no written description of certain limitations, one of ordinary skill in the art would not be enabled to make those limitations without undue experimentation. This does not fit the test for enablement. While we agree with the written description rejections, the fact that limitations are not described does not establish that it would take undue experimentation for one of ordinary skill in the art to make what is claimed. The level of

skill in the pertinent arts of computers, memory architecture, and computer programs was high. Although the *Wands* factors are only for guidance, the examiner has not provided any explanation of why one of ordinary skill could not make the broadly claimed subject matter without undue experimentation. We conclude that the examiner has failed to make out a *prima facie* case of lack of enablement, not that the claimed subject matter is enabled. The enablement rejection of claims 98 through 102, 104 through 108, 115, 116, 120 through 125, 131 through 141, 143 through 147, 154, 155, 161 through 164, 170, 171, 175 through 195, 204 through 206, 211 through 219, 227 through 254, 263 through 265, 273 through 278, 286 through 288, 297 through 304, 307, 310, 311, 314, 317, 320, 323, 324, 327, 330, 331, 334, 336 through 338, 341 through 346, 349, 351 through 353, 356 through 361, 364, 366 through 368, 371, 374 through 377, 379, 382, 384, 389, 390, and 392 through 395 is reversed.

CONCLUSION


The decision of the examiner rejecting claims 98 through 102, 104 through 108, 115, 116, 120 through 125, 131 through 141, 143 through 147, 154, 155, 161 through 164, 170, 171, 175 through 195, 204 through 206, 211 through 219, 227 through 254, 263 through 265, 273 through 278, 286 through 288, 297 through 304, 307, 310, 311, 314, 317, 320, 323, 324, 327, 330, 331, 334, 336

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Application No. 08/465,072

through 338, 341 through 346, 349, 351 through 353, 356 through 361, 364, 366 through 368, 371, 374 through 377, 379, 382, 384, 389, 390, and 392 through 395 under 35 U.S.C. § 112, first paragraph, is affirmed as to the written description rejection and reversed as to the enablement rejection.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED


KENNETH W. HAIRSTON
Administrative Patent Judge

Lee E. Barrett
LEE E. BARRETT
Administrative Patent Judge

Anita Pellman Gross
ANITA PELLMAN GROSS
Administrative Patent Judge

BOARD OF PATENT
APPEALS
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Appeal No. 2002-0652
Application No. 08/465,072

GILBERT P HYATT
PO BOX 81230
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**Ex parte Hyatt, Decision on Rehearing, Appeal No. 2002-0652,
in patent application Serial No. 08/465,072
(PTO Bd. App. Sep. 30, 2003) (unpublished PTO decision)**

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 58

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

MAILED

SEP 30 2003

U.S. PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte GILBERT HYATT

Appeal No. 2002-0652
Application No. 08/465,072

HEARD: October 22, 2002

Before HAIRSTON, BARRETT, and GROSS, *Administrative Patent Judges*.
GROSS, *Administrative Patent Judge*.

REQUEST FOR REHEARING

In a decision dated June 30, 2003, the decision of the examiner rejecting all of the claims on appeal under the written description portion of the first paragraph of 35 U.S.C. § 112 was affirmed.

Appellant's arguments (Request, pages 1-9) with respect to the claimed temporal interpolation, spatial interpolation, undersampling and spatial interpolation responsiveness, interaction between temporal and spatial interpolation, and making a product steps have been reviewed but have been found to be new and/or inconsistent with the Briefs on appeal. As such

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they are untimely, and will not be considered, since such arguments should have been originally made in the Briefs on appeal. A Request for Rehearing is not the proper vehicle to present such a showing for the first time.

Specifically, in appellant's reading of claims 105, 177, 190, and 191 on the disclosure, in the Supplemental Appeal Brief, appellant pointed to elements 110A and 110R for temporal interpolation and to element 110E for spatial interpolation. Now, in the Request (pages 1-8), appellant asserts that spatial interpolation is implemented in 110E-110G and 110R. The two readings on the disclosure are inconsistent.

In addition, nowhere in the Briefs did appellant explain that spatial interpolation is "implemented in both the "spatial module" 110E-110G (the spatial postprocessor) and in the "supervisory processor" 110R . . . (the spatial preprocessor)," as now indicated on page 1 of the Request. Therefore all arguments directed to preprocessors versus postprocessors (i.e., Request, pages 1-8) are considered to be new and untimely. Similarly, appellant's arguments (Request, pages 8-9) directed to the product steps are different from those in the Briefs and, therefore, are new and untimely.

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Appellant's argument (Request, page 10) that the examiner never explained what claim interconnections and interrelations form the basis of the written description rejection is without merit. The rejection specifically noted four claim limitations (undersampling, temporal interpolation, spatial interpolation, and spatial filtering) and stated that interconnections and interrelationships between those claimed elements lacked written description support in the disclosure. Appellant was clearly notified in the final rejection of the limitations that the examiner found to be without written description and, thus, there is no reason why the arguments now presented could not have been presented in the Appeal Brief, Supplemental Appeal Brief, or Reply Brief.¹

Appellant's request (Request, pages 10-13) to denominate the rejection as a new ground of rejection under 37 C.F.R. § 1.196(b) because the decision relied on a different thrust or rationale to support the rejection is not well-taken. The rationale in our decision is the same as the examiner's, that the claimed

¹ We note that appellant is an experienced *pro se* applicant and a registered patent agent who has prosecuted many patent applications (including appeals to the Board, the Court of Customs and Patent Appeals, and the U.S. Court of Appeals for the Federal Circuit) for over 30 years and who should be familiar with how to write an appeal brief.

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interconnections and interrelations are lacking from the written description.

Appellant argues (Request, page 13) that the Board should denominate the decision as a new ground of rejection because appellant was not given a fair opportunity to meet the objections with evidence and argument. The examiner, however, made his position clear in the final rejection. Appellant had ample opportunity to particularly point out support for the specific claim limitations.

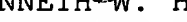
Appellant urges (Request, page 13) that denomination of the rejection as a new ground is necessary because he is unable to refile. However, appellant was clearly notified in the final rejection of the limitations that the examiner found to be without written description. Appellant, thus, had the opportunity to respond in full to the rejection and failed to avail himself of it. Therefore, we refuse to denominate the rejection as a new ground under 37 C.F.R. § 1.196(b).

Appellant's request for rehearing has been granted to the extent that our decision has been reconsidered, but such request is denied with respect to making any modifications to the decision.

Appeal No. 2002-0652
Application No. 08/465,072

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

**REHEARING
DENIED**


KENNETH W. HALRSTON
Administrative Patent Judge


LEE E. BARRETT
Administrative Patent Judge

Anita Pellman Gross
ANITA PELLMAN GROSS
Administrative Patent Judge

BOARD OF PATENT
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Appeal No. 2002-0652
Application No. 08/465,072

GILBERT P. HYATT
P.O. BOX 81230
LAS VEGAS, NV 89180

**Ex parte Hyatt, Decision on Appeal No. 2002-0623,
in patent application Serial No. 08/471,633
(PTO Bd. App. Oct. 24, 2003) (unpublished PTO decision)**

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 51

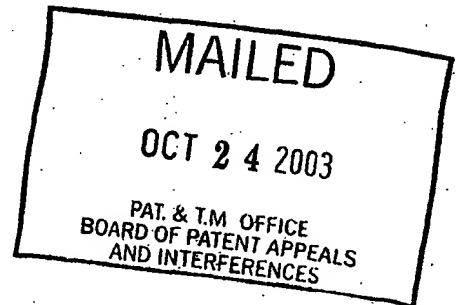
UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte GILBERT P. HYATT

Appeal No. 2002-0623
Application No. 08/471,633

HEARD: JULY 17, 2003



Before HAIRSTON, BARRETT, and GROSS, Administrative Patent Judges.

HAIRSTON, Administrative Patent Judge.

DECISION ON APPEAL

This an appeal from the final rejection of claims 98 through 174 and 302 through 475.

According to the appellant (brief, page 7), "[t]he instant claims are directed to an image information wrap-around invention."

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Application No. 08/471,633

Claim 118 is illustrative of the claimed invention, and it reads as follows:

118. A system comprising:

a two dimensional memory storing image information, a two dimensional portion of the two dimensional memory having two dimensional portion boundaries;

a vector circuit generating prior vector information defining a prior position in the two dimensional memory;

a vector change circuit generating delta vector information defining a next position in the two dimensional memory relative to the prior position in the two dimensional memory in response to the prior vector information;

a testing circuit generating wrap around information if the next position exceeds at least one of the two dimensional portion boundaries; and

a wrap around circuit generating next vector information wrapped around the exceeded two dimensional portion boundary in response to the wrap around information and in response to the delta vector information.

The references relied on by the examiner are:

| | | |
|------------------------------|-----------|---------------|
| Marsh | 4,179,824 | Dec. 25, 1979 |
| Netravali et al. (Netravali) | 4,245,248 | Jan. 13, 1981 |

Claims 98 through 174 and 302 through 475 stand rejected under the first paragraph of 35 U.S.C. § 112 for lack of written description.

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Claims 98 through 174 and 302 through 475 stand rejected under the first paragraph of 35 U.S.C. § 112 for lack of enablement.

Claims 98 through 174, 302 through 469 and 471 through 475 stand rejected under 35 U.S.C. § 103 as being unpatentable over Netravali in view of Marsh.

Reference is made to an early Office Action (paper number 16), the briefs (paper numbers 29, 31 and 41) and the answer (paper number 35) for the respective positions of the appellant and the examiner.

OPINION

We have carefully considered the entire record before us, and we will sustain the lack of written description rejection. On the other hand, we will reverse the lack of enablement rejection and the obviousness rejection.

Turning first to the lack of written description rejection, the examiner put appellant on notice as to his position based upon the quoted excerpt from an early Office Action (paper number 16, page 44) which states that:

All of the claims are directed to subject matter that is not adequately described in the specification. Specifically, the image processing system, including the memory systems, the coordinate circuits, the vector circuits, and the wrap-around circuits, that is recited

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in the claims is not adequately described in the specification so as "to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention" as required by 35 U.S.C. [S] 112, first paragraph.

Appellant has responded to the lack of written description rejection by pointing to elements in figures and corresponding pages in the originally filed specification that allegedly provide support for the system limitations of claim 118, and the process limitations of claims 136, 141 and 153 (brief, pages 8 through 12).

The examiner's response to appellant's analysis is a continuation of the noted earlier Action. The examiner states (answer, page 11) that all of the claims on appeal recite various limitations that are either explicitly or implicitly connected to and dependent upon other claimed elements, but that "[n]owhere in the lengthy specification does Appellant actually describe a complete and functioning system that would correspond to the claimed subject matter." Stated differently, "[w]hile there may be mentions of these various elements (or processes) scattered throughout the specification, there is no disclosure of actually combining these disparate items into one complete integrated

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system as is now claimed" (answer, page 12). The examiner reaches the conclusion (answer, page 13) that:

There is nothing that the Examiner could find in these Figures and pages cited by the Appellant (nor is there anything cited by Appellant) that discusses how these varied elements and procedures could be used in (or combined into) one complete system as is now being claimed. Further, there is nothing explicit, implicit, or inherent in the original specification to combine these separate elements into a single system as claimed.

In essence, the examiner's position is that "[t]he interconnections and interactions of the claimed components to perform the claimed functions in combination is lacking from Appellant's specification" (answer, page 16) (emphasis added).

With respect to the product claims, the examiner indicates (answer, page 18) that "[t]here is simply no description in the specification, or any depiction in the drawings, of making these claimed 'products' . . . in response to the limitations of other claims."

In direct response to appellant's arguments concerning claim 118, the examiner acknowledges (answer, page 40) that "'a two dimensional memory storing image information' is a relatively standard element in itself, and, even in 1984, did not require extensive description to make and use." We consider this statement by the examiner to be an admission that the

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specification provides an adequate written description for such a memory performing the recited function. We do take note of the examiner's concern that this memory is not described in the written description in combination with the remainder of the claimed elements (answer, pages 40 through 43). To be more specific, the examiner is of the opinion (answer, pages 43 through 46) that the referenced figures of the drawing and the referenced pages in the specification do not disclose a "vector circuit generating prior vector information defining a prior position in the two dimensional memory," "a vector change circuit generating delta vector information defining a next position in the two dimensional memory relative to the prior position in the two dimensional memory in response to the prior vector information," "a testing circuit generating wrap around information if the next position exceeds at least one of the two dimensional portion boundaries," and "a wrap around circuit generating next vector information wrapped around the exceeded two dimensional portion boundary in response to the wrap around information and in response to the delta vector information."

Turning to claim 136, the examiner does not question the written description support for the first three process steps of this claim, but he does, however, question the written

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description support for the subsequent steps (i.e., the steps of "generating wrapped-around image memory write address information," "writing wrapped-around input image information into an image memory in response to the accessed database image information and in response to the wrapped-around image memory write address information," "storing the wrapped-around input image information in the image memory," "generating wrapped-around image memory read address information," and "generating accessed wrapped-around translated image information in response to the wrapped-around input image information stored in the image memory and in response to the wrapped-around image memory read address information") (answer, pages 46 through 52).

Turning next to claim 141, the examiner indicates (answer, pages 52 through 56) that the originally filed disclosure lacks written description support for all of the steps of this claim because the phrase "rectangular mosaics" does not appear in the original disclosure, and because of the noted "wrapped-around" steps.

Turning lastly to claim 153, the examiner contends (answer, pages 57 through 59) that all of the process steps of this claim lack written description support in the originally filed disclosure.

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In our review of appellant's specification, we found a lack of critical features and process steps as well as "interconnections" and "interactions" between such claimed features and process steps. Based upon such deficiencies in the written description, we find that the examiner had a reasonable basis for questioning the written description for each of the rejected claims on appeal, and the burden of proof thereafter shifted to appellant. In re Wertheim, 541 F.2d 257, 263, 191 USPQ 90, 97 (CCPA 1976).

As indicated supra, claims 118, 136, 141 and 153 are the only claims on appeal that appellant has read on the disclosure for a showing of written description support¹ (brief, pages 8 through 12). We have reviewed the portions of the drawing and the disclosure suggested by the appellant, and we agree with the findings supra made by the examiner with respect to claims 118, 136, 141 and 153. The referenced portions of the drawings and

¹ Appellant has the duty under 37 CFR § 1.192(c)(8)(i) to "specify the errors in the rejection and how the first paragraph of 35 U.S.C. [§] 112 is complied with, including, as appropriate, how the specification and drawings . . . [d]escribe the subject matter defined by each of the rejected claims" (emphasis added).

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specification do not provide written description support for the elements and steps listed in these claims.

Appellant's numerous arguments throughout the briefs, particularly the discussion of the specification in general and the case law surrounding written description, were not helpful in our quest to assess the written description support for the claimed subject matter. The mere fact that individual words in the claims appear throughout the disclosure is not helpful to an understanding of how all of those words are tied together in each of the claims on appeal (brief, pages 38, 39, and 49 through 52; reply brief, pages 4, 10, 23, 92, 105, 106 and 120). The same holds true for all of the incorporated-by-reference material in the disclosure. Appellant has never read the claim limitations on specific portions of that massive body of material incorporated into the disclosure, and arguments in general about incorporation-by-reference (brief, pages 27, 37, 42, 49, 67 through 69, 73, 77 through 80 and 82; reply brief, 16, 103, 119, 121, 123, 125 and 126) can not take the place of such a demonstration by appellant. Appellant's arguments (brief, pages 16 through 20, 23 through 25, 70 and 141; reply brief, pages 4, 5 and 7) that the examiner's rejection is not supported by "substantial evidence" is not germane to the issue before us.

because "substantial evidence" refers to the standard of review that the U.S. Court of Appeals for the Federal Circuit applies to the Board's factual findings, and not to the Board's review of the examiner's findings. In re Gartside, 203 F.3d 1305, 1315, 53 USPQ2d 1769, 1775 (Fed. Cir. 2000). The judicial review provisions of Gechter v. Davidson, 116 F.3d 1454, 43 USPQ2d 1030 (Fed. Cir. 1997) are equally inapplicable to the issue before us (reply brief, pages 5 and 6).

In summary, the lack of written description rejection of claims 118, 136, 141 and 153 is sustained. The lack of written description rejection of the remainder of the claims on appeal, including the product-related claims,² is sustained because appellant has not demonstrated how these claims have written description support in the disclosure.

Turning to the lack of enablement rejection, the examiner is of the opinion (answer, page 24) that the claims on appeal are nonenabling because the elements noted supra "were not at all

² The mere mention of products in the specification is not an adequate demonstration by the appellant that he had support in the disclosure on the filing date of the original application for making the products via the claimed processes (brief, pages 53 through 67; reply brief, pages 112, 113, 118 through 124, 183 and 184).

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Application No. 08/471,633

discussed in any single embodiment of the specification or shown in any Figure." According to the examiner (answer, page 25) "[t]he specification, at best, simply mentions some of the claimed words (or variations thereof) without providing any actual disclosure as to how the elements are to be constructed or how the elements are to be used or how they function, in combination with one another or individually." The examiner concludes (answer, page 26) that "it is clear that Appellant did [not] provide an enabling disclosure of the claimed invention or the corresponding material mentioned in the specification . . . , but simply had some things that might be able to be done, but no specifics as to how to implement these possibilities."

It is apparent that the examiner is using the same deficiencies that supported the lack of written description rejection to demonstrate that the appellant has presented a nonenabling disclosure. It is noted that a specification may enable one skilled in the art to make and use an invention and yet still not describe it for written description purposes. Vas-Cath, Inc. v. Mahurkar, 935 F.2d 1555, 1561, 19 USPQ2d 1111, 1115 (Fed. Cir. 1991). The showing made by the examiner does not demonstrate that one of ordinary skill in the art would have to resort to undue amounts of experimentation to arrive at the

claimed invention. Thus, we are of the opinion that the examiner has not established a prima facie case of lack of enablement,³ and that the burden of rebuttal did not shift to appellant. If the Office meets its burden, "the burden then shifts to the applicant to provide suitable proofs indicating that the specification is indeed enabling." In re Wright, 999 F.2d 1557, 1561-62, 27 USPQ2d 1510, 1513 (Fed. Cir. 1993). In view of the foregoing, the lack of enablement rejection is reversed.

Turning lastly to the obviousness rejection, we have reviewed all of the examiner's findings (answer, pages 30 through 38) concerning the teachings of Netravali and Marsh, and we conclude that the inherency findings and the taking of Official Notice coupled with the admitted shortcomings in the teachings of each of these references weigh too heavily against a finding of a prima facie case of obviousness. Even if the teachings of these references are combined in the manner suggested by the examiner, we must agree with the appellant's argument (brief, pages 128 through 130) that all of the limitations of the claims on appeal

³ Our finding that the examiner did not establish a prima facie case of lack of enablement does not mean that the claimed subject matter is enabled.

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would not have been suggested by the combined teachings. Thus, we agree with the appellant's arguments (brief, pages 128 through 130, 138 and 139; reply brief, pages 210, 213, 215, 221 through 223, 226 and 227) that the obviousness rejection should be reversed.

DECISION

The decision of the examiner rejecting all of the claims on appeal under the written description and the enablement portions of the first paragraph of 35 U.S.C. § 112 is affirmed as to the lack of written description, and is reversed as to the lack of enablement. The decision of the examiner rejecting claims 98 through 174, 302 through 469 and 471 through 475 under 35 U.S.C. § 103 is reversed.

Appeal No.. 2002-0623 "

Application No. 08/471,633

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED

KENNETH W. HAIRSTON
Administrative Patent Judge

LEE E. BARRETT
Administrative Patent Judge

ANITA PELLMAN GROSS
Administrative Patent Judge

BOARD OF PATENT
APPEALS AND
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Appeal No. 2002-0623
Application No. 08/471,633

GILBERT P. HYATT
P.O. BOX 81230
LAS VEGAS, NV 89180

**Ex parte Hyatt, Decision on Rehearing, Appeal No. 2002-0623,
in patent application Serial No. 08/471,633
(PTO Bd. App. Jan. 30, 2004) (unpublished PTO decision)**

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 53

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte GILBERT P. HYATT

Appeal No. 2002-0623
Application No. 08/471,633

HEARD: JULY 17, 2003

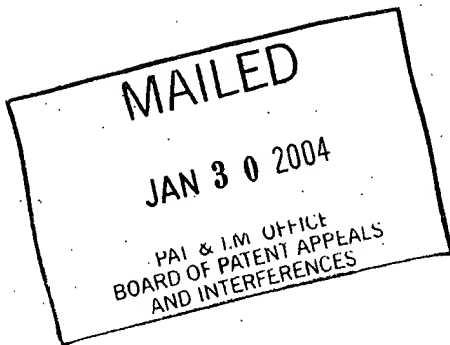
Before HAIRSTON, BARRETT, and GROSS, Administrative Patent Judges.

HAIRSTON, Administrative Patent Judge.

ON REQUEST FOR REHEARING

In a decision dated October 24, 2003, the decision of the examiner rejecting all of the claims on appeal under the written description portion of the first paragraph of 35 U.S.C. § 112 was affirmed.

Appellant now argues (request, pages 1 and 2) that the Board previously held in other related cases that the originally filed disclosure provided literal written description support for each of the individual elements recited in the claims, and that the Board should do the same in this case. In response to



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Application No. 08/471,633

appellant's request, we find that the examiner as well as the Board has already made such a finding as indicated by the following excerpt from our decision in this case:

Stated differently, "[w]hile there may be mentions of these various elements (or processes) scattered throughout the specification, there is no disclosure of actually combining these disparate items into one complete integrated system as is now claimed" (answer, page 12). The examiner reaches the conclusion (answer, page 13) that:

There is nothing that the Examiner could find in these Figures and pages cited by the Appellant (nor is there anything cited by the Appellant) that discusses how these varied elements and procedures could be used in (or combined into) one complete system as is now being claimed. Further, there is nothing explicit, implicit, or inherent in the original specification to combine these separate elements into a single system as claimed.

In essence, the examiner's position is that "[t]he interconnections and interactions of the claimed components to perform the claimed functions in combination is lacking from Appellant's specification" (answer, page 16) (emphasis added).

Thus, appellant's arguments (request, page 2) that "[t]he Examiner found nothing at all in the disclosure to support the claims," and "clearly overlooked, disregarded, or misrepresented the most relevant part of the disclosure" are in error.

The briefs in this case contained extensive discussions of the varied elements set forth in the disclosure, and in several

of the claims on appeal. Appellant now presents the same type of discussion of the individual elements found in the disclosure (request, pages 3 through 23), without any clear discussion as to the "'interconnections' and 'interactions' between such claimed features and process steps" (decision, page 8). As stated by the Board (decision, page 9), "[t]he mere fact that individual words in the claims appear throughout the disclosure is not helpful to an understanding of how all of those words are tied together in each of the claims on appeal."

Appellant argues (request, page 9) that:

The Board holds that the Examiner made an admission and the Board relies on and reinforces this admission. However, this admission all by itself establishes written description of the issues in the rejection (Decision at 5-6 (emphasis added)):

We consider this statement by the examiner to be an admission that the specification provides an adequate written description for such a memory performing the recited function.

The quoted excerpt from our decision is self-explanatory.

In other words, we found that the examiner had merely acknowledged that a two-dimensional memory storing image information is a known element and function, and that the

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Application No. 08/471,633

specification provides an adequate written description for such a memory performing the noted function. Nothing more can be gleaned from our findings concerning the two-dimensional memory.

Appellant argues (request, page 12) that the Experimental System discloses "all of the claim limitations in a 'complete and functioning system,'" and that the Board has overlooked this showing. We disagree. To the contrary, the Board was left to its own devices, without much help from the appellant in the briefs, to review the myriad pieces of the so-called experimental system for written description of the claimed invention. As indicated in the decision, our efforts did not bear fruit.

Appellant argues (request, pages 13 through 18) that the disclosed DIS.ASC software provides a software implementation of the claim limitations. We disagree. Neither the noted software nor the accompanying explanation of the software provides written description support for all of the limitations of claims 118, 136, 141 and 153.

Application No. 08/471,633

Appellant's request for rehearing has been granted to the extent that our decision has been reconsidered, but such request is denied with respect to making any modifications to the decision.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

REHEARING
DENIED

KENNETH W. HAIRSTON
Administrative Patent Judge

LEE E. BARRETT
Administrative Patent Judge

ANITA PELLMAN GROSS
Administrative Patent Judge

BOARD OF PATENT,
APPEALS AND
INTERFERENCES

KWH/hh

Appeal No. 2002-0623
Application No. 08/471,633

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